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MODEL AIRPLANE

THE WORLD'S PREMIER R/C MODELING MAGAZINE



The AERONCA Story

Canada $3.75

Q.S.A.A. Rally

Royal's Aerobatic CHIPMUNK

Basics of Scratch-Building

Plans Catalog Inside!

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MARCH 1987 VOLUME 114, NUMBER 3

MODEL AIRPLANE NEWS



ABOVE AND ON THE COVER: A classic in the eye of any tin hangar grease monkey or high time SST pilot, the Aeronca, simply stated, is a national treasure—and this one, flown by Jim Moser over St. Augustine, Florida, is no exception. Owned by Jim and Jacque Marsh of St. Augustine, the "Air-knocker" is a historic aircraft worthy of modeling, the start of which can come from Budd Davisson's aerial-view feature article on page 52, or from the inspiration given by Gene Thomas in his cut-away drawing of the aircraft. Cover photo by Budd Davisson.

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Associate Publisher
YVONNE M. MICIK

Editor-in-Chief/Associate Publisher
LOUIS V. DeFRANCESCO JR.

Editor
DAN SANTICH

Associate Editors
ART SCHROEDER
CHRIS CHIANELLI
RICHARD URAVITCH

Managing Editor
MARY HENNESSY

Editorial Assistant
RICHARD V. NACCA

Technical Editor
CHARLES KENNEY

Art Direction and Design
ALAN J. PALERMO

Art Assistant
JUDY LIND

Advertising Director
LOUIS V. DeFRANCESCO JR.

Advertising/Production Manager
DEBBI O'CONNELL

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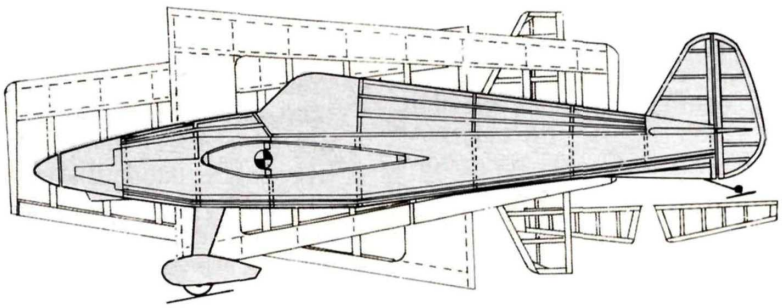
Editorial

by DAN SANTICH

Scratch Design Contest

LET'S HAVE A DESIGN CONTEST. I know that there are some dynamite airplanes out there that you'd like to see available either in plans or in kit form. For some reason, the guy who's flying that super-duper sky ripper won't come forward with plans for all of us to share. Perhaps he's timid. Or maybe he simply doesn't know how to go about having his design published. Well it's really quite simple, and the rewards can be many. Take my Hots for example. It was published in *Model Airplane News* and then became so popular that Midwest picked it up as a kit. How did I go about it?

Actually, I built the first one without any plans. I wanted something for a fun-fly, found nothing to my liking, so I sat down and built the Hots. I built it in one evening! As it turned out, I won the fun-fly and the Hots got a lot of attention, which led to me drawing up the plans and ultimately having it published—which then led to the kit. You can do the same thing, although you don't have to go about it the way I did. All you have to do is build a model, draw up your plans (I drew the Hots plans in pencil on butcher paper), take some pictures, and send it in. It's that simple.



For the purposes of this design contest you don't even have to go that far. All you have to do is send me a picture and a description of the model. It can be any kind of R/C model—scale, sprint, giant, pattern, racing, indoor, rubber power, electric or whatever. We'll publish the pictures of all the airplanes and then let you decide the winners.

Once the winners are selected, they'll be notified and expected to furnish us the drawings, photographs, and construction article manuscript for their model. What will the winner get?—$1,000—and in addition, we'll give away radios and engines to the runners up, with the option to also publish designs that we feel other modelers would be interested in building.

Next month we'll run a formal announcement for this contest, so in the meantime you can be thinking about it and how you're going to spend your winnings!

THIS MONTH. If you missed the QSAA Rally, you really missed something. A real, honest-to-goodness jet! It was there, plus a lot more, which authors Mike Lee and Dick Philips share with you. The "other Cub" Aeronca is given a tire-kicking by Budd Davisson, and Reed Kalisher hitches up to a Royal product review. Art Schroeder renews his type certificate in the Texson Tooter and Chris Chianelli finds happiness in cyanoacrylate heaven with Pacer's line of with Pacer's line of adhesives. Top that off with another lesson in scratch-building, by yours truly, and you've got an issue for just about everyone to enjoy.

One last note: This issue also features a listing of plans for you scratch-building enthusiasts. I know many of you have sent two dollars in for the Plans Directory and a more comprehensive one will be mailed to you shortly. Because of innumerable new projects and magazines the Plans Directory was placed on the back burner, so we decided to print it in *Model Airplane News* as a stop gap.

Happy modeling! ■



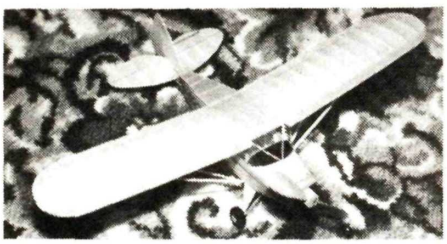
Airwaves

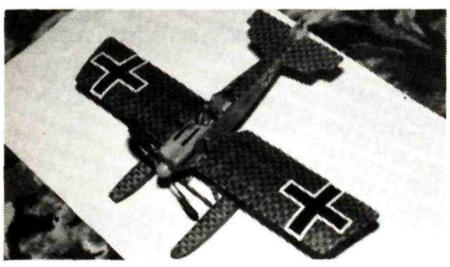
Hello!

Let me tell you a little about myself. My name is Jan Nowak and I'm 25 years old. My main interests are deep-vees and fliffer R/Cs. I also like reading interesting modeling magazines, and especially reading about problems of modeling. Over 13 years, I've collected plans, literature, and materials.

I'd like to become a pen pal with an interested American with similar pursuits. I'm looking to exchange modeling magazines, plans, engines, and literature. So, if it's possible, please insert my request in your magazine and accept my deepest appreciation.

JAN NOWAK
42-200 Czestochowa
Orzechowskiego 5/1
Poland





I'm a Czechoslovakian airplane modeler and occasional reader of your magazine. I'm 26 years old, and I've been involved in modeling for over 10 years. Recently I've become interested in small Co^2-powered scale models, mainly in *peanut-size*, which appear in the photos. The first shows a Piper PA-15 Vagabond with 330 mm wingspan, weighing 3.5 grams; its best flight 72 seconds. The second photo shows a very attractive peanut, a German Zepellin-Lindau 1: 330 mm wingspan, weighing 8.7 grams; its best flight 47 seconds.

I'm writing you because I'd like to correspond with an American modeler with similar interests. I'd also like to exchange magazines, drawings, CO^2 engines, and more details about peanuts.

P. JELINEK
P.O. Box 385
500 05 Hradec Kralove
Czechoslovakia

A Current Trend?

Watt's this? There's a revolting development, it seems, taking place in your magazine. After getting all charged up by your July editorial that en-lightened all regarding electric-powered model aircraft, I was shocked to discover not a single article on the subject in the entire magazine. When I wired the folks at 'ohm, they really blew a fuse! I think it's amp-le cause to write and ask that you lower your resistance to printing articles on electro-flight. More electric stuff would make me ex-static! Joules truly,

DR. D.D. RODVIEN
Winchester, NH

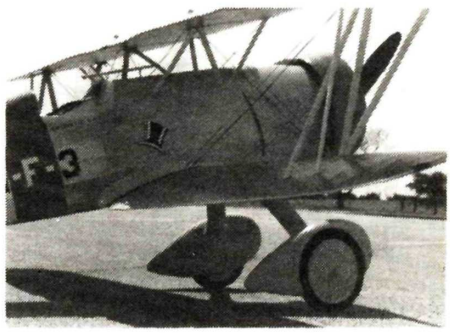
We hope the October 1986 issue gave you a charge! DBS

Tail Draggers

I'm writing in response to your article about tail draggers in the January '87 issue. You asked is any of your readers knew who invented the tail wheel? After looking through my files, I've come to the conclusion that it was Sir George Cayley, in the year 1849. This research is based on the *World Encyclopedia of Civil Aircraft* by Enzo Angelucci (pages 24-25).

Thanks so much for a thought-provoking article, I enjoyed finding an answer to your question. Perhaps someone else will find an even earlier date to the origin of the tail dragger. If so, you might publish your findings.

GEORGE L. ARDWIN
Sabina, OH



An OTer

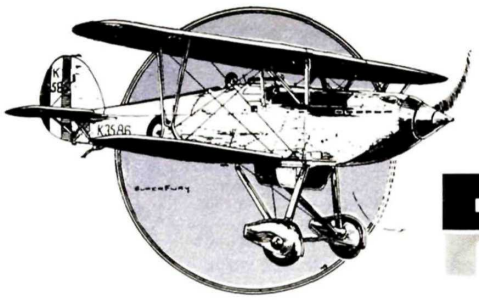
Having been an ardent model-builder and reader of your fine magazine since the late '30s, I think it's time I joined your club of contributors.

The photo shows my latest scale and one of my favorite aircraft, the F11C-2. What makes this model different from the usual F11C-2 is that it's powered by a Technopower II 9-cylinder radial. I used your drawings by William Wylam and enlarged them to 1/5-scale. The model weighed out at about 18 pounds.

As a point of interest, Mr. Lohmolder of Technopower II delivered one of his 9-cylinder radials to the Smithsonian Institute. I always look forward to your next issue!

MEL HUEY
Hanover, PA

We welcome your comments, opinions, and suggestions. Letters should be addressed to "Airwaves," Model Airplane News, 632 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and length.



Fifty Years Ago

by DAN SANTICH



A STATEMENT in *Jane's All the World's Aircraft, 1937,* by C.G. Grey, editor of *The Aeroplane,* concerning the directions and development of the U.S. air arm stated, "Meantime the Boeing Company, which jumped into popular fame a few months ago by producing a heavily-armed all-metal four-motor bomber, which was nicknamed by the press 'the Flying Fortress,' quite erroneously, because its metal skin is not even proof against machine-gun bullets, has produced a passenger-carrying version of the big bomber." Quite obviously the British gave little regard to the fact that a fortress can be defensive as well as offensive, given the proper arrangement of weaponry. In later years the Brits would find a new appreciation for the airplane, as would the Germans.

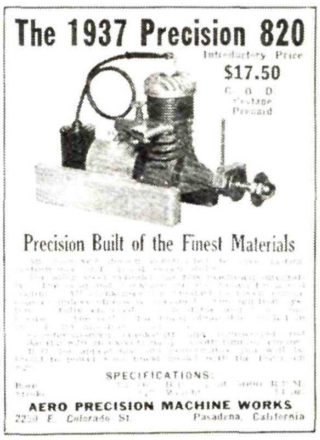
On the modeling front, the shift toward gas engine-powered models was taking over the hobby. Almost every month a new motor or a new kit was introduced onto the market. Engines were under constant change by the manufacturers in an attempt to keep up with the rapid developments. Ohlsson offered an ignition engine with platinum points which, according to them, would increase its performance. Others were offering "hop-up" kits for most gas engines, and the accessory lines for things like propellers, plugs, points, condensers, and coils were opening up for the modeler. Membership in the International Gas Model Airplane Association was exploding, with over 1,700 modelers registered.

Hints and ideas were even being shared by modelers in 1937. Leo Rutledge of Wichita, Kansas, sent in a suggestion for running an engine in cold weather: "Run the motor indoors, then put the airplane in your car with the engine close to the car heater. When you get to the flying field, run the motor again, put on the wings, and it's ready to go places." Some things never change!

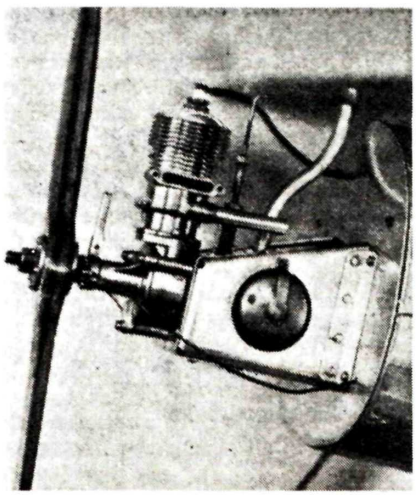
That's the way modeling was in March 1937 and *Model Airplane News* was there to tell you about it. ■



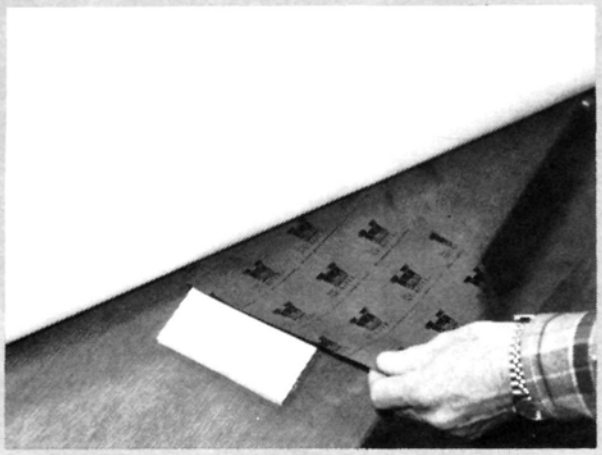




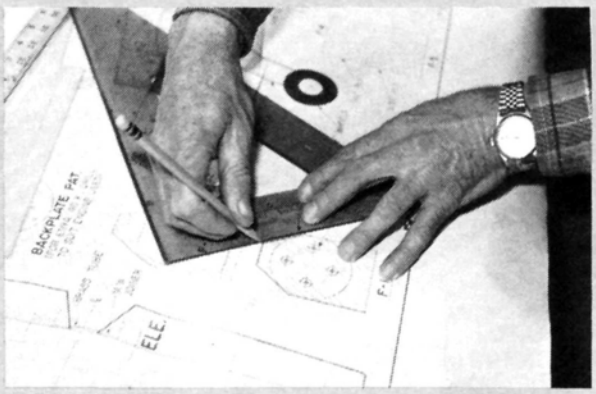
In March 1937 modelers were treated to a host of kits, engines, and accessories, and the gas-engine-powered model boom was on!



Basics of Scratch



1. To trace part, use typewriter tracing paper.



2. Draw part using a straightedge.

THE BASIC ingredient of scratch-building is a set of plans. These plans are not unlike architectual drawings for a house. They show you the material, where it goes, and the final shape. Just as in building a house, a model airplane is put together in sections or sub-assemblies, which are then assembled to make up the final object. The sequence of the assembly is important, just as in a house, so you will not get ahead of yourself or build something that doesn't fit. For example, if you build a house and forget the plumbing, you have a big problem. Similarly with building a model airplane, if you complete a fuselage without provisions for the fuel tank, you could be in trouble.

If you intend to build a model from a set of plans, it's a good idea to obtain a copy of the construction article that was written in conjunction with the design. In most cases, the article will tell you the proper sequence of assembly and what materials to use. It will also give you tips on equipment installation, how to trim the model, and finally how to fly it.

I always recommend buying two sets of plans. Use one set for the construction and one set for reference. You'll find that you'll be cutting parts, drawing patterns, and generally destroying the plans in the construction process, so it's a good idea to have a spare set.

Interpreting a set of plans can be very perplexing, especially to someone new to scratch-building. Each part on a drawing should be identified and the material used depicted. The plan also indicates the proper grain direction of the wood for a particular part. It's important that you use this information while building your model.

Something to remember about plans, any plans, is that *none of them are 100% accurate.* This is because of the method in which they are reproduced and the material they are reproduced on. Also, generally speaking the larger the plan, the greater the errors. Blueprint paper will expand and contract with moisture. The image transfer process in blueprint machines will also give a slight distortion to the reproduced sheet. It's therefore essential that you not only check the



5. A triangle should be used during assembly.



6. Align fuselage sides over plans center-line.



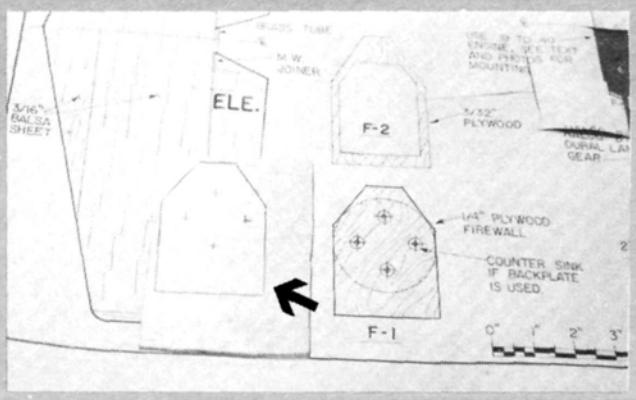
7. With a master rib pattern, draw ribs on balsa sheet.

Building

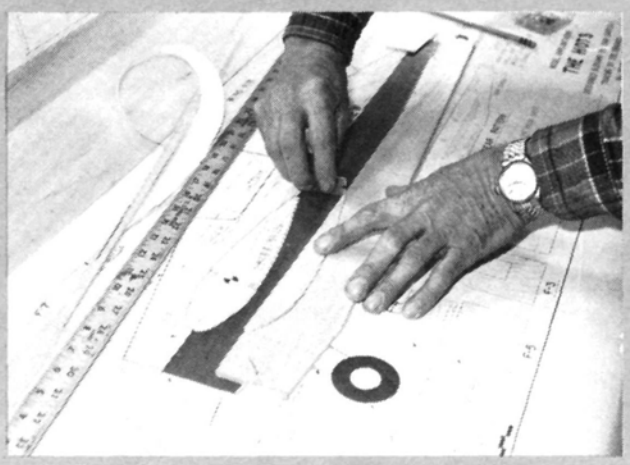
PART II

by Dan Santich

How to read plans and build your model correctly.



3. Part drawn should be an exact copy.



4. Check part with plans after cutting to size.

symmetry of each part, but the size before you glue it in place. It's not uncommon to have one wing half slightly shorter or longer than the other on a blueprint, so make sure you check them also. One way you can do this is to cut one of the wing half drawings out of the plans and lay it on the other and then hold it up to the light. Of course the easiest way to check them is to measure them. But even with that, the rib placement can be a bit different, as well as the aileron location and size.

Similarly with the horizontal stabilizer, bulkheads, and control surfaces. Everything should be checked for equal size when there is a left- and a right-hand side. Most of the time the parts to be checked are recognized by the location of a centerline. The centerline is one of the most important reference points for building a model from plans.

Most drawings used for the construction of model airplanes show the fuselage side and top views, the horizontal stabilizer top view, and the wing top or bottom view. This is so you can build the wing over the plans and at least one side of the fuselage. Since you have two fuselage sides that are identical yet reversed (a left and right), it's usual practice to build one side, then the other. If there are stringers to add to the sides, such as the 1/8-inch square strips, you can assemble one side and use it as a guide for the other.

Since no two pieces of balsa wood are the same, either in weight or grain, the bending qualities will be different between them. For this reason, when you glue the two sides to the bulkheads and then glue the back end together, you'll often find that one side seems longer than the other. Naturally it isn't because you checked that, remember? The way to assemble the fuselage sides is either in a jig or over a centerline on the plans, which is why the top view is shown.

Assembling a model that is scratch-built is no different than assembling from a kit. There are logical steps to follow that apply to virtually any model you build. For an airplane to fly properly, it must be aligned in a symmetrical fashion about the vertical and horizontal centerlines, and the weight must be equal about the



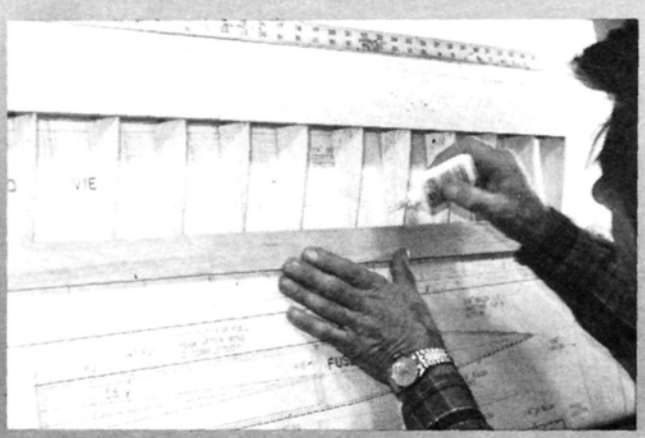
8. Final-sand ribs to the same shape.



9. Wax can be used to prevent parts from being glued to plans.



10. With ribs in place, check for uniformity.



11. Make sure wing is flat before gluing to sheeting.



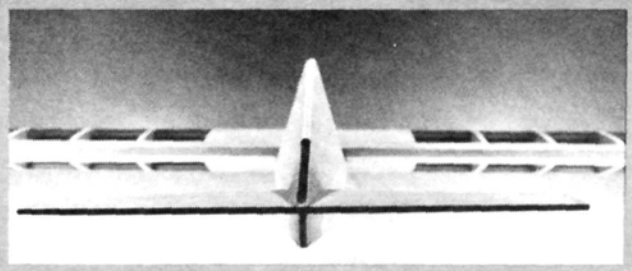
12. Use a flat sanding board for straight surfaces.

roll axis.

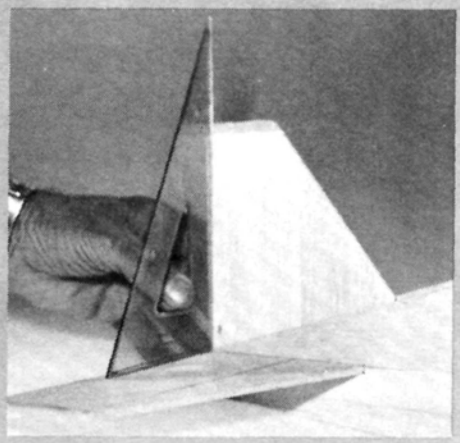
When you assemble the fuselage sides, it's important that the bulkheads are perpendicular to the horizontal centerline. If not, the sides will not have equal curvature, thereby leading to a difference in aerodynamic reaction. Similarly, if the fuselage is not straight, your engine thrust line will be off, as well as the vertical stabilizer. There is no way to correct this situation other than to build a new fuselage, so try to get it right the first time.

Once you have the fuselage built, assemble the stabilizer parts but don't glue them in place. This is so you can align everything first. Set the fuselage on a flat surface and place the stab and wing in position. Measure the height of each wing tip from the floor. If there is a difference, trim the fuselage wing saddle down on the high side until they are both equal. Do the same thing to the stab until it is parallel with the wing.

The next step is to align everything from overhead. Mount your wing, make sure it is exactly centered, then position your horizontal stab. Measure from the trailing edge of the wing to the back of the stab where the elevator attaches. Either side of the horizontal stab should be the same distance from the wing. When it is, pin it in place. Now pin the vertical stabilizer in place and sight down the front of the airplane. If all you can see is the leading edge of it, great. Take a triangle and check to see that it is vertical.



13. Horizontal stab should be parallel with wing.



14. Use triangle for stab alignment.

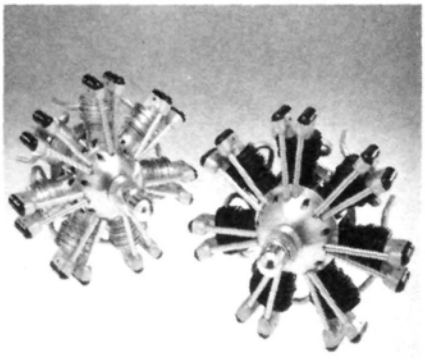
When setting up the wing and stab, it's also a good idea to use the Robart* Incidence Meter. This will tell you if the incidence (angle of attack) is off.

Glue the horizontal and vertical stabs in place and double check that they are still aligned. Next month I'll go into covering, and engine and radio installation. I hope you'll be here.

Dan Santich, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the company mentioned in this article:*

Robart, 310 N. 5th St., St. Charles, IL 60174. ■



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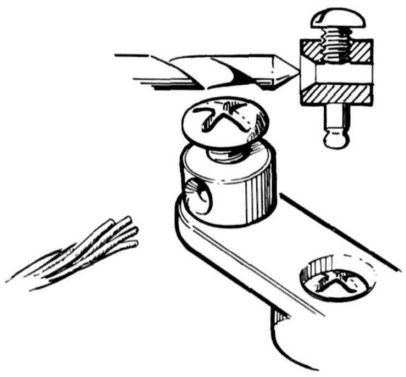
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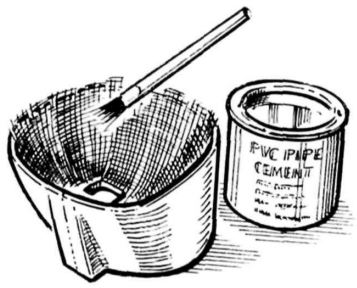
Hints & Kinks

by JIM NEWMAN

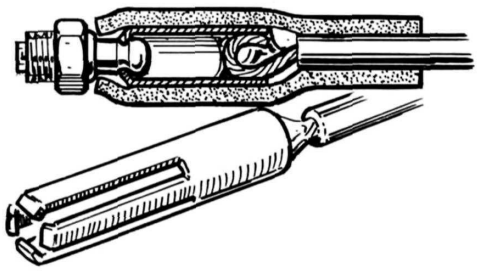
Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News,** 632 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.



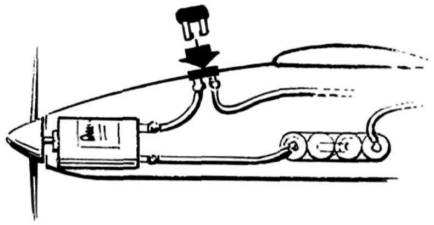
If you swap radios between models and also use steel push-pull cables, you know it's not easy to insert frayed cable into servo connectors. It helps to countersink the connector hole for easier entry. Contributor used an old Phillips screw driver as a countersink bit, but a reground drill will do it nicely. *Anthony Roth, Sequim, Washington*



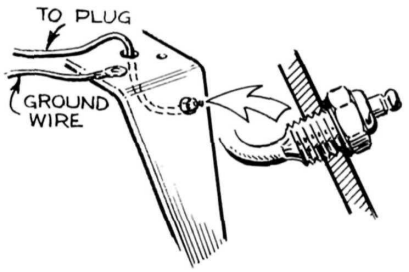
Here is a method of reinforcing those molded ABS cowls supplied in some kits. Cut 1 ounce of glass cloth into 2x2-inch squares, then line the inside of the cowl using the pipe cement used for p.v.c. plumbing pipes. This works great on ABS but not so well on polystyrene used by some molders.
Ralph Andrae, Crystal Lake, Illinois



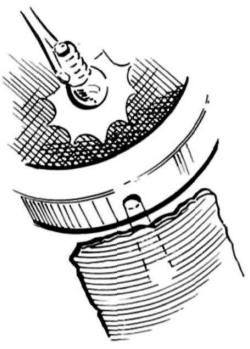
Using on-board ignition? This is a home-made plug connector for under the cowl. Slit brass tube with a Dremel grinding disc, bend ends of tabs to grip plug, then solder in flexible copper wire. Note how silicone rubber fuel line grips insulation to support copper wires.
Patricio Wenborne, Santiago, Chile



A great safety tip for electric fliers—especially if inquisitive youngsters are around. Prevent accidental motor switch-ons by mounting fuse socket outside. Fuse link is only inserted immediately prior to launch and after checking throttle stick is all the way back. Remove link before retrieving model. *Jim Madsen, Fresno, California*



A way to keep fingers clear of the propeller. Drill out a "dead" glowplug, solder in copper wire, then fillet with silicone rubber. Drill and tap landing gear to 10-32, then screw in modified plug. Run the wire to the plug in the head (why not use Patricio's connector?) and run another (ground) wire from landing gear to engine mount bolt. Attach glow clip to the modified plug.
Paul Bourne, St. Johns, NFW, Canada



This worked well when trying to align drilling sites of inner and outer fan housings, on a ducted-fan unit, for passage of needle extensions, etc. Dim the shop lights, then use flashlight bulb to project light spot through hole and on to outer housing. When spot is perfectly circular, the centers are coincident and can be marked.
Mont Jay Cartwright, Orland Park, Illinois



Coverite's the only company with 5 different coverings

Here's how to pick one that's perfect for your model

Coverite is the only company in the world that makes every type of covering required. . .whether it's for the Wright Brothers 1903 "Flyer", or a supersonic jet.

Following are the 5 coverings:

Black Baron Film-Hi-gloss plastic film with iron-on adhesive coating. Fully finished.

Super Coverite-Fabric with iron-on adhesive coating. Unfinished.

Permagloss Coverite-Same fabric & adhesive as Super Coverite, but fully finished with factory paint job.

Micafilm-Ultra light, re-inforced film without any adhesive coating. Applied over a Balsarited surface. Fully finished.

Silkspun Coverite-Spun-bonded fabric with iron-on adhesive coating. Unfinished.

To help you choose the correct covering for your next model, here are descriptions of each covering, and its recommended uses.

BLACK BARON FILM

The highest quality iron-on film covering made anywhere in the world. Proved best in *all* 5 tests: 1) puncture strength; 2) bubble resistance; 3) contouring without wrinkles; 4) adhesion to everything including foam; 5) hiding grain & fillers. Model Airplane News said ". . .it's great stuff. . .very easy to work with. . .able to shrink and eliminate any wrinkles." RCM said ". . .total lack of bubbles. . .grain of balsa hidden . . .finally a wing without wrinkles on the tips. . .survived dead stick landings along with the resultant trip through the weeds, without any damage."



Colors: white, black, fire red, cub yellow, flag blue, light blue, orange. Coming: Fokker red & cream.
Sizes: 27" x 72"
Weight: 2 oz./sq. yd.
Subjects: WWII, Scale Civilian, Military, Gliders, Sport Models, pattern. All beginners.

SUPER COVERITE

This is the original iron-on fabric covering introduced in 1968, used by more champions world-wide than any other. Looks like finely woven silk, but takes less time to finish because its adhesive coating acts as a filler coat. Unique soft adhesive system makes it virtually goof proof-the choice of expert and beginner alike. Can be finished with a coat of clear producing a translucent effect; or fully painted to simulate the fabric covered aircraft of the pre-WW II eras.
Colors: white, red, yellow, blue, orange, antique tan.
Sizes: 38" x 47" and 47" x 15 ft.
Weight: 2.4 oz./sq. yd.
Subjects: Antique, WW I, early WW II, Golden Era, Old Timers, All beginners.



PERMAGLOSS COVERITE

The one and only iron-on fabric with a completely finished paint job, baked on in the factory oven. 4 coats of no-scuff, 100% fuelproof paint in an authentic satin gloss shine. Finished weight is far less than painted fabric. Same fabric & iron-on adhesive coating as SUPER COVERITE. Can be used to trim itself in multiple color designs eliminating the need to paint.
Colors: white, black, dark red, brite red, dark blue, lite blue, cub yellow, orange, cream.
Sizes: 38" x 43" and 43" x 15 feet
Weight: 3.5 oz./sq. yd.
Subjects: WW I, early WW II, Golden Era.

MICAFILM

An iron-on film reinforced with extremely thin but very tough mica fibres. Yet is less than ½ the weight of other films. On the Elmendorf tear strength machine, *Micafilm* scored a remarkable 14.1 against 1.69 for its nearest competitor. Actual weights range between ¾ ounce per sq. yd. for the clear version to 1½ ounces for metallics. Unlike all our other coverings, *Micafilm* has no adhesive coating. To apply, brush Balsarite on the wood surfaces, wait a few minutes til dry, then iron down.



Colors:
Translucents: red, yellow, blue, orange, clear and pearly white.
Opaques: pearly white, flat yellow, metallic red, metallic blue, the only authentic looking aluminum around and Pre-Primed for the painted metal look.
Sizes: 29" x 65" and 29" x 16.4 feet
Weight: from ¾ oz. to 1.3 oz./sq. yd.
Subjects: Gliders, Electrics, Old Timers, Aluminums, All painted metals.

SILKSPUN COVERITE

Looks like tissue, but is actually made of spun-bonded fibres that iron-on and have extraordinary tear strength. Same iron-on adhesive coating as SUPER COVERITE. Expecially recommended for sheeted surfaces where it goes on 100% bubble-free. Can be finished with a coat of clear to duplicate the old-timer's tissue and dope; or fully finished with paint to achieve a smooth painted metal appearance.
Colors: white only
Sizes: 38" x 54" and 38" x 25 feet
Weight: 2.4 oz./sq. yd.
Subjects: WW II, Scale Civilian, Military, painted metals, All beginners.

For a free copy of our new **Black Baron Guide To Covering** containing additional information on all of our iron-on coverings including a chart showing recommendations for 47 popular model airplanes, write to Coverite. However, you must include a stamped, self addressed envelope.

COVERITE

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(Illustrations by Robert S. Cooper
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SUPPORT EQUIPMENT

Basics of Radio Control

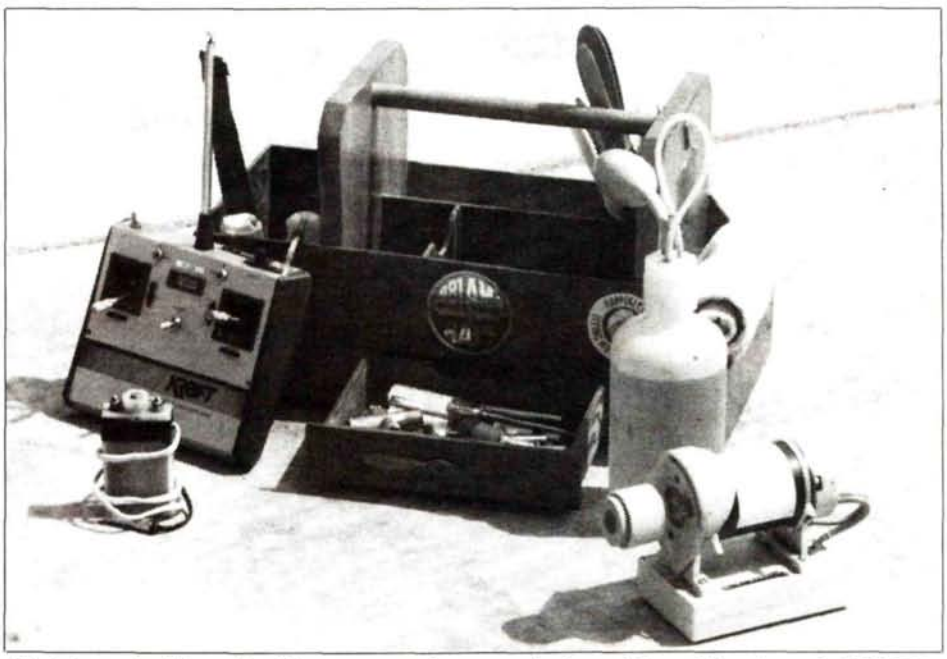
by RANDY RANDOLPH

ONCE THAT new training airplane is finished, there is some planning that must be done before that first trip to the field. Since most modelers fly at a location remote from their workshops, it's necessary to take to the field certain items that the airplane will need. The carrying device that holds all these items is called the "flight box." The carrying device itself can be as simple as a cardboard box if it contains the right equipment. Let's see what that equipment is.

The basic necessities are fuel, starting battery, and transmitter. It's true that these are the only three things that are absolutely necessary for engine-powered airplanes, but let's look closer.

Fuel in a can is of little use until it is placed in the aircraft's fuel tank. Therefore, some method of pumping, pouring, or squirting fuel into the tank is needed. This can be done with something as simple as a small funnel or an eye dropper, neither of which is very practical. Some sort of pump, as well as the tubing necessary to make the connection between it and the tank, makes a much better arrangement. Pumps can be hand-operated or electric and both work very well. Check the advertisements in this and other magazines for your choice.

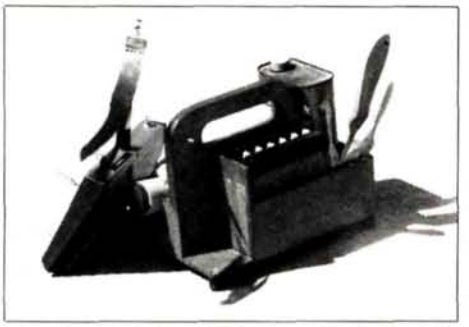
Next on the required list is the starting battery. A 1.5-volt dry cell with proper glowplug connector will work, but not very long. The glowplug is a rather high current device and dry cells are made for low-current use. A Ni-Cd starting battery with connector and charger is not expensive and will outlast thousands of dry cells. A dead starting battery is very frustrating so most experienced fliers carry a spare.



Flight boxes should contain all the support equipment an airplane might need for a day at the field. This one has a drawer for small parts as well as being partitioned for fuel, starter, transmitter, etc.

The last of the basic three is the transmitter. This seems so obvious that it should go without saying, but everyone who flies has left his transmitter at home at least once and most of us more than once. The transmitter should have a proper frequency flag so your frequency can be seen and noted by other fliers. Remember, your transmitter should *never* be turned on until you're *sure* your frequency is clear and not being used by someone who is flying. All fields have some sort of frequency control, find out what it is and use it!

The big three are the essentials, let's see what else the flight box should hold that will help us spend more time in the air.



This box might be called a "flight line box" as it holds only starter, props, and fuel.

Propellers and glowplugs are expendable, so spares of the proper sizes should be included in your box. The guy who goes to the field with only one prop is almost sure to break it, but when there is a spare in the box, it will last for weeks!

The same is true for glowplugs. When the engine fails to start, the first thing to check is the battery. If it makes a new plug light up, it's okay. The next check is the engine plug. If it doesn't glow, replace it with the new one. Don't forget to replace the spare on your next trip to the hobby shop!

Propellers and glowplugs require wrenches of some sort to install and remove. By far the handiest is a four-way wrench that will handle a variety of prop nuts as well as glowplugs. On some engines the plug is recessed deep into the head and a rather thin walled socket is necessary for its replacement. Check your engine for the proper size prop and plug wrenches.

Before every flying session all screws and nuts on the engine should be checked, and tightened if necessary. Nevertheless, it's good to have screw drivers and allen wrenches that match the nuts on the engine, and mount, in the flight box. A pair of pliers, extra rubber bands, a length of fuel line, and a knife will also come in very handy.

I've covered the necessary and the needed, now it's time to talk luxury! An electric starter with 12-volt motorcycle



Standard flight-line necessities are spare glowplugs, pliers, plug wrench, and prop reamer.

battery, or Ni-Cd pack, is the first thing that comes to mind. A "chicken stick" is the next best thing and a very good investment for winter cranking when engines tend to be hungry for fingers. Oh, band-aids too!

A big soft towel and a spray bottle of window cleaner make after-flying clean-up much easier. A starting battery with a meter to read plug current is nice. Even better would be a 12-volt system that would provide, and meter, all power requirements and be able to recharge transmitter and receiver batteries as well!

Then there are wind speed and direction indicators, drink coolers, portable barbecues, a tent, motor generator—a flight box *can* get out of hand!

Randy Randolph, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■



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Construction

Twilighter

by L.F. RANDOLPH



Randy's granddaughter, Sheri Snithers, demonstrates the convenience of the Twilighter, built in R/C and sailplane versions.

TWILIGHTER started life as a hand-launched sailplane and was successful to the extent possible with a somewhat aged and overworked arm. When the fact that I was not what I used to be was faced, I built a new fuselage to accommodate an .049 engine. With the new power source and some tinkering, the airplane became what was hoped for initially, a quiet easy-flying machine for leisure hours at the local school yard.

The tinkering consisted of adding a muffler, three head gaskets and an 8x4 prop to the engine. With this arrangement the airplane is almost as quiet as an electric and, if allowed, will climb completely out of sight in the 8 minutes of power provided by the Golden Bee tank.

As for aerobatics, or tricks as my schoolyard friends call it, I'm afraid not! It was designed to climb, cruise around for a while, and glide back in a lazy sort of way. I think it would make an excellent trainer for someone who must learn to fly R/C without the help of an instructor. It *is* gentle.

CONSTRUCTION. The construction is rather simple and should be completed in a week of evenings even if built at a leisurely pace. The structure is all balsa with the exception of the plywood firewall and dihedral braces and the hardwood dowels that anchor the wing-holding rubber bands. Start the wing by gathering the wood for the ribs, spars, trailing edges, webs, dihedral braces, and wing tips.

There are several ways to cut out wing ribs from 1/16-inch balsa sheet. Making a card-stock template and tracing around it with a fiber-tip pen to produce a "printed sheet" is my favorite, but blanks can be cut from sheet, stacked and pinned together, then the ribs band-sawed all at once. Whichever way you choose, 28 are required. Trim 1/16 inch from the top and bottom of two of them for the center ribs, which will be covered with 1/16-inch sheet, and enlarge the spar notches of four more to receive the plywood dihedral braces. Strip the spars and leading and trailing edges from the appropriate size sheet balsa and cut the dihedral braces from 1/16-inch plywood. Make the spar

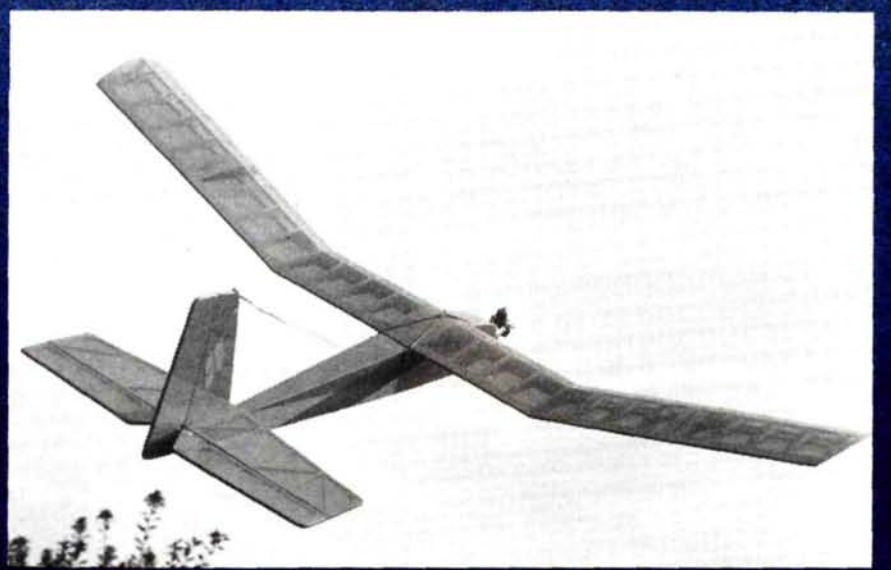


Jon Smothers, Randolph's grandson, prepares to launch for an after-school flying session.

SPECIFICATIONS

Type: *Basic R/C Trainer*
Channels: *2/3*
Wingspan: *53 inches*
Area: *355 square inches*
Weight: *16 ounces*
Engine: *.049 to .051*

Introduce your son and his friend to R/C with this basic trainer!



webs from vertical grain balsa sheet and the tips from soft 1/8-inch wood.

The wing is built in three pieces, a center section and two tip sections. The plan shows the center and one tip section. The second tip is identical to the first and is built over the same plan by reversing sides with the angled rib at the dihedral joint (i.e., on the right side instead of the left).

Cover the plan with wax paper and pin the main spar and the bottom trailing edge sheet in place over the center section plan. Trim a piece of 1/16-inch sheet, 2 1/4 inches wide, to fit between the bottom main spar and the trailing edge, and glue it in place at the center of the wing. Then glue the two center ribs to the spar, the sheet, and the trailing edge. Glue one of the spar webs between them, then add the rest of the webs and ribs. The ribs with the trimmed main spar notches are slanted at the angle shown on each side of the center section. Add the top main spar and the top leading edge spar and the leading edge. When the glue has set, remove the section from the plan and add the bottom leading edge spar and trim all spars, the leading and trailing edge, flush with the end ribs.

Build both tip sections in the same manner; one left,

TWILIGHTER

A quiet, easy-flying machine for leisure hours. It is gentle!

one right. The top spars are trimmed at the outboard ends to fit against the 1/8-inch sheet tips at the angle shown in the dihedral diagram.

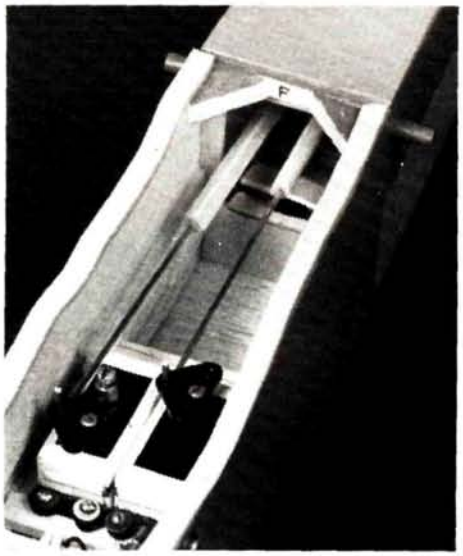
The three sections are joined by pinning the center flat on the bench or board, elevating the tips 4½ inches, and gluing the ply dihedral braces on each side of the main spars where they join. Glue the leading and trailing edges and the faces of the ribs together as well. When both tips are joined to the center and the glue has set, add the top trailing edges, then turn the wing over and add the dihedral braces to the bottom spars. Complete the sheeting of the wing center and sand the complete wing. Before covering, glue a piece of 1/16-inch music wire to the trailing edge at the center to keep the wing-holding rubber bands from digging into the wood in this area.

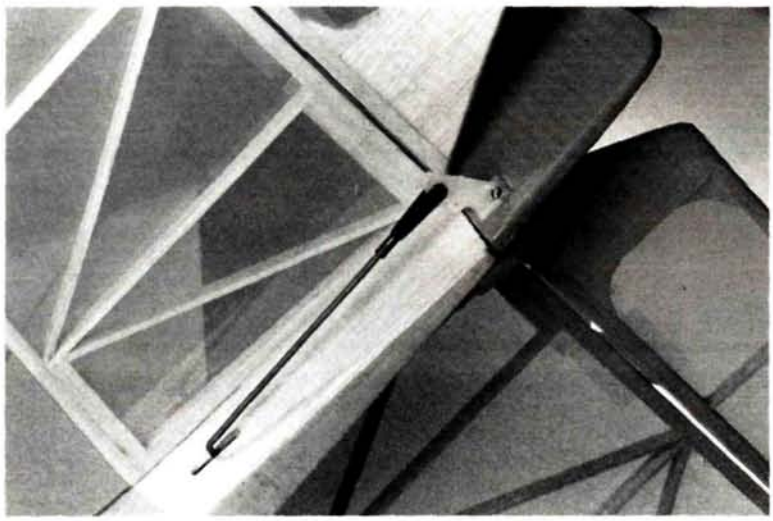
The stab and rudder are both built from 1/8x1/4-inch and 1/8-inch-square balsa which can be stripped from sheet wood. The leftover pieces are used as uprights during fuselage construction. Build right over the plans after covering them with wax paper. Build the elevator in one piece, joined by the leading edge spar, and when the 3/32-inch music wire carry-through is glued in place, the wood in that area can be trimmed away. The sheet parts of the rudder and stab can be soft wood but the part of the elevator that

(Continued on page 78)

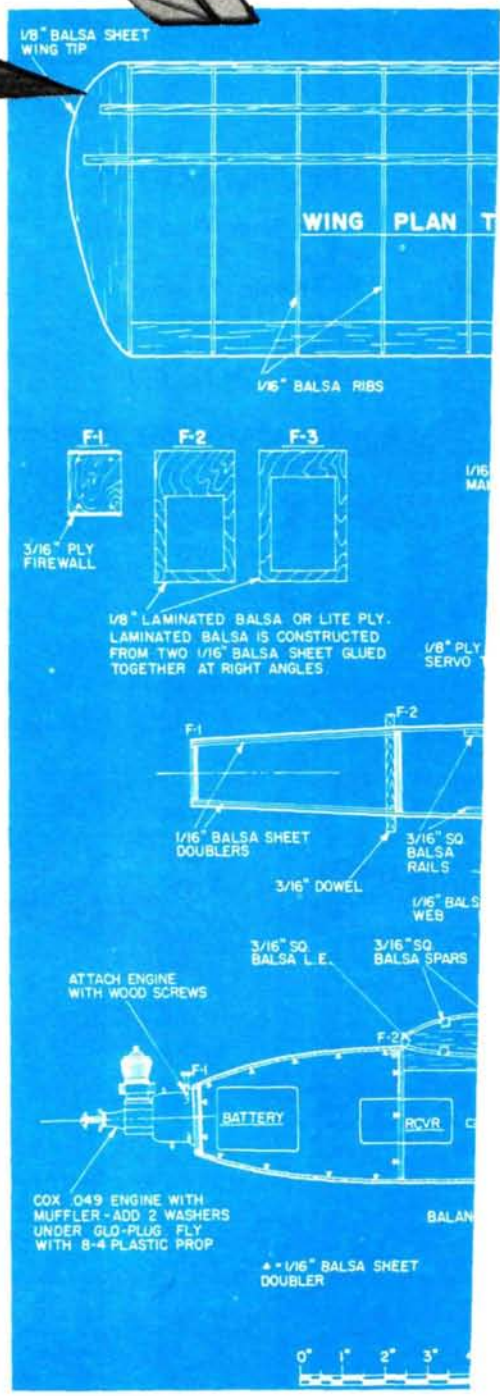


Since the engine has no throttle, two servos do the work. A 500-mA battery and combined radio and airframe weight are still less than a pound.

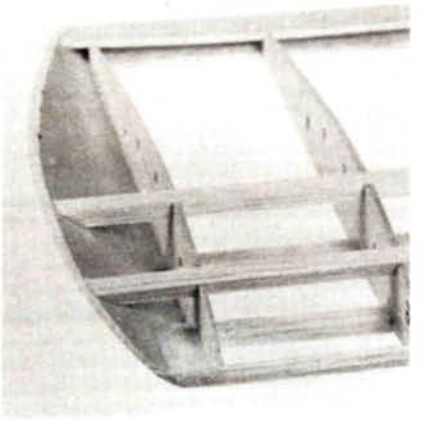




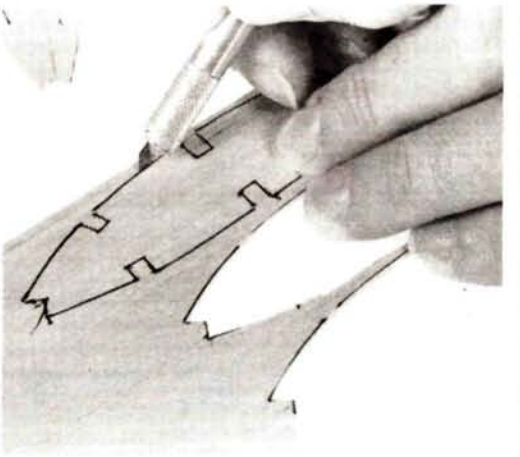
Stab and elevator assemblies are glued to the fuselage after they are covered. Film must be stripped at glue joints.



FOR ORDERING INFORMATION, SEE PAGE 124



Tips which conform to the airfoil are supported by top spar extensions.



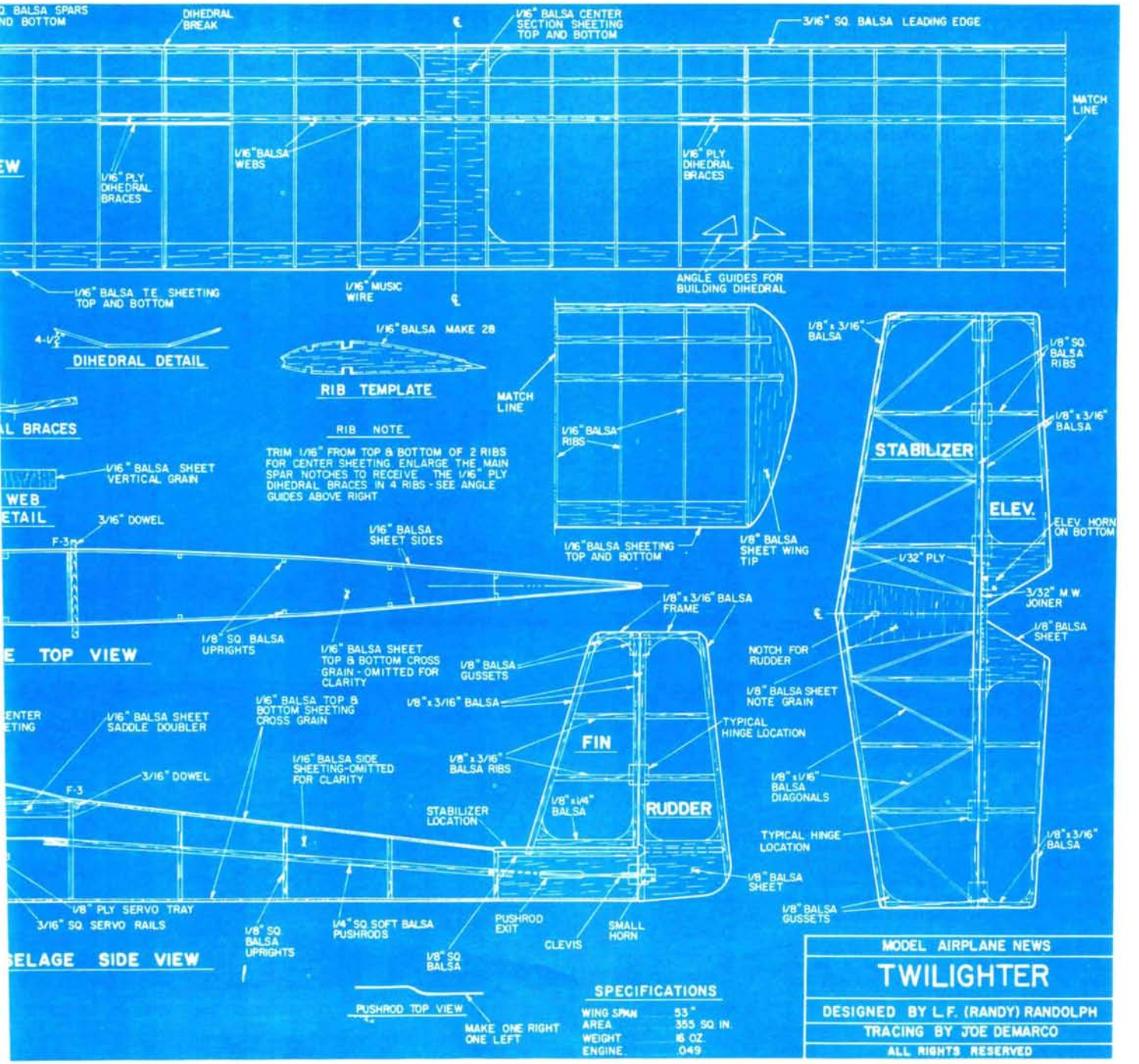
A cardboard template is used as a rib pattern and then traced on balsa sheet.

Order the Full-Size Plan!



#3871 TWILIGHTER $12.00

Your basic aircraft for learning to build and fly R/C, the Twilighter combines a simple design with a 2- or 3-channel radio and a .049 or .051 engine that is an inexpensive way into the hobby with no compromise in the fun factor. Span is 53 inches and wing area is 355 square inches.

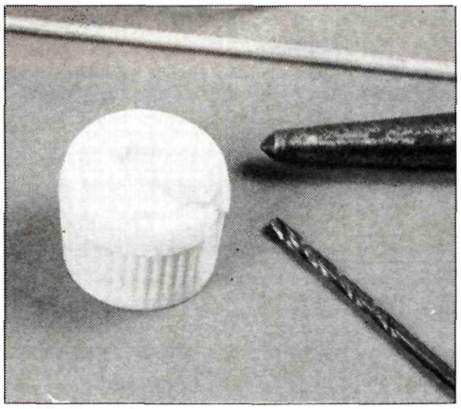


How To:

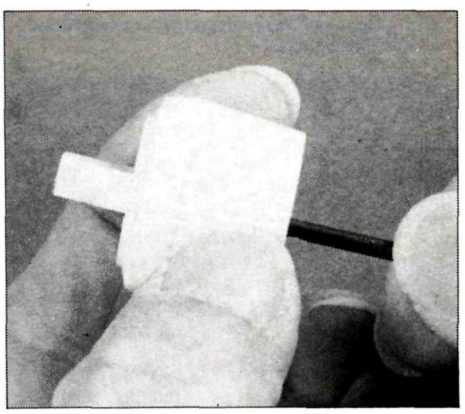
by RANDY RANDOLPH

MAKE A SQUEEZE FUEL BOTTLE

There are lots of ways to fuel airplanes. Pumps, syringes, funnels, hypodermics, and siphons have all been used. Some, of course, work better than others! The fueling system described here is not as good as the best, nor as bad as the worst, but the price simply can't be beat. For small airplanes, or as a priming bottle for large ones, it's really not bad at all. The photos show the way.



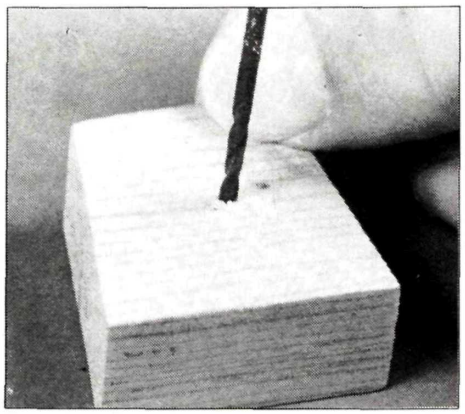
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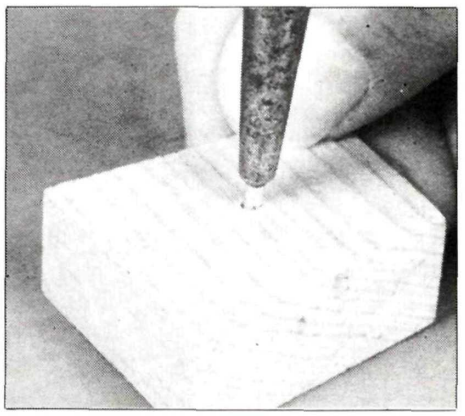
2.

1. The materials needed are a plastic bottle with flip-top spout, a 3/32-inch drill, a center punch, and a piece of 3/32-inch copper or brass tube. Discarded hand lotion bottles are ideal.

2. The first step is to open the flip-up spout and run the 3/32-inch drill through it from the bottom. As a rule this can be done with the fingers as shown, but if the fit is tight use a hand drill.



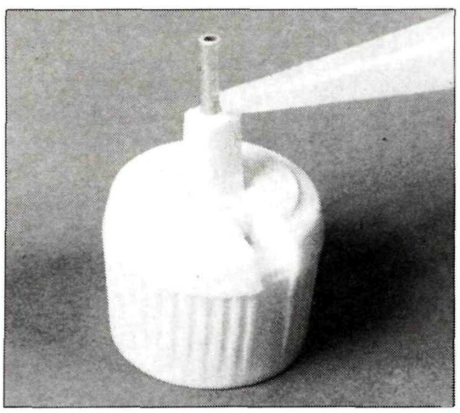
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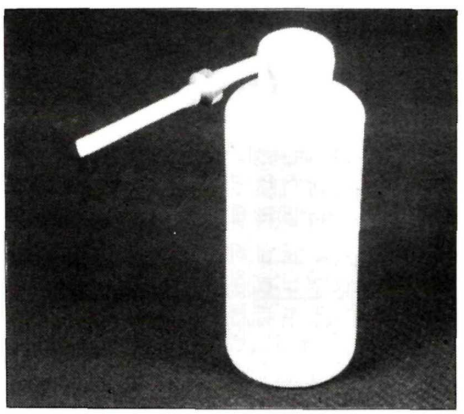
4.

3. Drill a 3/32-inch hole in a 3/4-inch block of scrap hardwood. This will be used as a fixture to flare one end of the brass tube which will become the spout.

4. Cut a length of 3/32-inch brass tube about 1/16 inch longer than the thickness of the wooden block. Put the tube in the hole, place the block over a metal surface and use the center punch to slightly flare the top of the tube.



5.



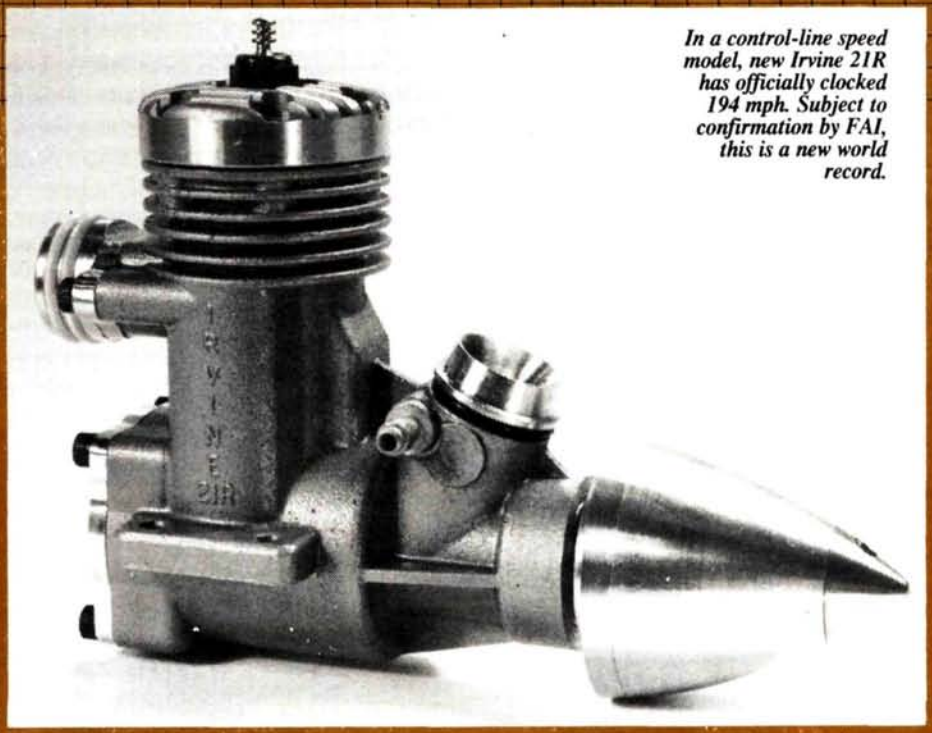
6.

5. Push the tube up through the open cap spout from the bottom. The flared end of the tube will seat against the drilled part of the spout. Check to see that the spout will flip shut, then add a drop of instant glue around the top to complete the seal.

6. Two pieces of fuel tube and a filter slipped over the brass spout finish things out. To fill a tank, simply connect and squeeze. To empty a tank, squeeze first, then connect!

Engine Review Round-Up

by PETER CHINN

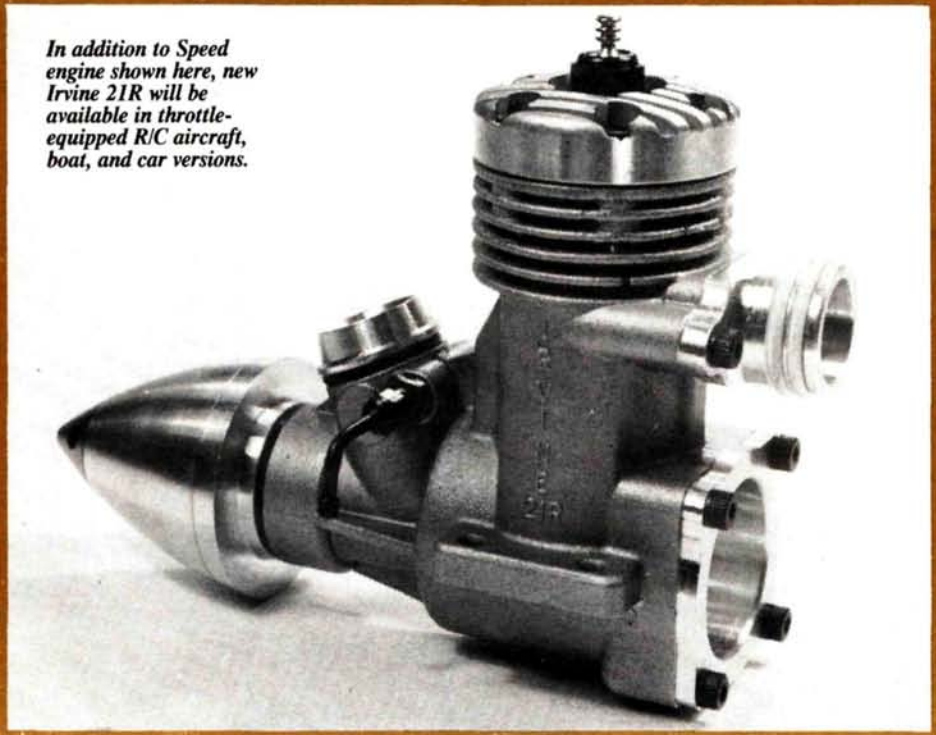


In a control-line speed model, new Irvine 21R has officially clocked 194 mph. Subject to confirmation by FAI, this is a new world record.

IRVINE 21R SPEED

SPECIFICATIONS

Type: Single-cylinder, rear-exhaust, two-stroke-cycle, with crankshaft rotary-valve and Schnuerle scavenging.
Bore: 0.650 in. (16.51 mm)
Stroke: 0.640 in. (16.26 mm)
Displacement: 0.2124 cu in. (3.480cc)
Nominal Compression Ratio (full stroke): 10:1
Speed Control: None
Checked Weight: 229 grams (8.08 oz)
Mounting Dimensions:
Crankcase width: 29.3 mm
Length from prop driver face: 73.8 mm
Height above CL: 56.6 mm
Bolt hole spacing: 36.5x15.9 mm (1 7/16x5/8 in.)
Manufacturer's Claimed Power Output: Not stated. (See text)
Manufacturer: Irvine Engines Ltd.,Brunswick Industrial Park, New Southgate, London N11 1JL, England.
U.S. Sales: Tower Hobbies, P.O. Box 778, Champaign, IL 61820.



In addition to Speed engine shown here, new Irvine 21R will be available in throttle-equipped R/C aircraft, boat, and car versions.

THIRTY-SIX years ago, K&B boss John Brodbeck put into production K&B's first .20 cu in. size engine, the Torpedo 19. At that time, control-line speed flying was at the peak of its popularity and the recipe for a successful racing engine was twin ball-bearings, a ringed aluminum piston and a rear rotary disc valve. The Torpedo 19 had none of these features. It used the strictly "sport engine" mix of a plain bronze-bushed main bearing, a lapped cast-iron piston and induction via a port in the crankshaft journal.

Imagine, then, the surprise when one of these unpretentious-looking K&Bs (admittedly in the hands of Bill Wisniewski) not only broke the U.S. Class A (0.20 cu in.) C/L speed record, but, even more significantly, actually flew faster than the existing Class B (0.30 cu in.) record.

Past history. Long forgotten? Not by speed buffs of the period. And it all came flooding back when we learned of recent achievements with a new Irvine engine by the British speed flier Peter Halman. Here is a situation which bears an uncanny resemblance to the K&B/Wisniewski performance back in 1951. Development engineer Halman happens to hold a



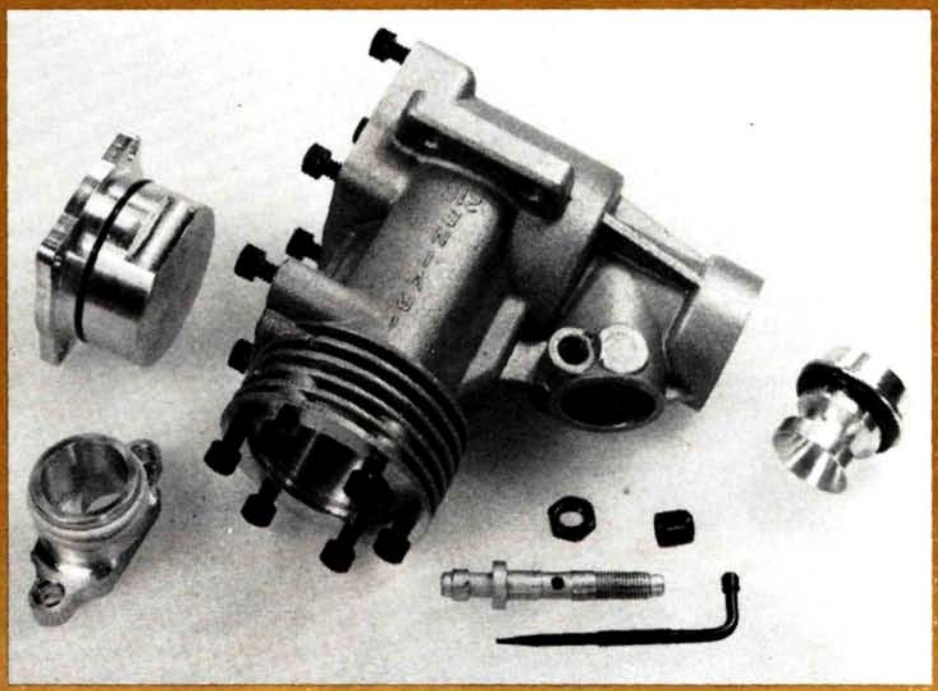
Left: Cylinder reverts to classic Schnuerle-plus-third-port scavenging system. Rod is machined and much heftier than previous forged rod. Below: Design and construction are conventional. Body is investment-cast, also shown are peripheral jet venturi and O-ring backplate seal.

position with Irvine Engines which parallels that of Wisniewski's long association with K&B and, during October, he flew one of the new Irvine 21R engines several times at over 190 mph, culminating in an officially observed record of 194 mph.

This was not only the fastest ever for a 3.5cc (0.21 cu in.) engined model; it was also a lot faster than the existing FAI world record for the 5cc (0.30 cu in.) class. The existing world record is held by the Soviet Union at a speed of 183 mph. A claim on behalf of Peter Halman has therefore been submitted to the CIAM for ratification as a new FAI world record. The outcome of this submission should be known by the time these words appear in print—or shortly thereafter.

Except for an increase in the exhaust period to 192° of crank angle, along with the addition of a purpose-built tuned exhaust pipe, the engine used for the record attempt was basically the same as the model shown here. This new Irvine engine will actually be available in four models; the other three being a water-cooled marine unit, a car engine and a standard throttle-equipped aircraft version.

In general design, apart from its rear exhaust layout, the 21R is closely related to the side-exhaust Irvine 20-ABC engine that we tested in both pylon-racing and standard R/C form and reported upon, in some detail, in the February 1984 *M.A.N.* Although the rear exhaust engine is designated "21," rather than "20," it has the same 0.650x0.640 in. bore and stroke measurement, both engines being just over 0.21 cu in., or 3.48cc, true displacement.



However, very few parts of the 21R-ABC are exactly the same as those of the 20-ABC, although some, such as the cylinder head and crankshaft, are interchangeable. One marked change is to the cylinder liner. The 20-ABC tested earlier had Irvine's distinctive multi-port Schnuerle scavenging system, common to other (Dykes ringed) Irvine engines. The multiple bridging, dividing the single exhaust port and three inlet ports into a total of nine individual ports, was not strictly necessary with the ringless piston of the 20-ABC, but was retained, presumably for the possible gas-flow benefits arising from the angled vane-like bridges. The 21R reverts to a more conventional Schnuerle-plus-third-port setup with a single Schnuerle type transfer port each side, angled toward the upwardly inclined third port diametrically opposite the exhaust. All ports are unbridged.

On the record engine, the upper edge

(Continued on page 68)

Engine Review Round-Up

by PETER CHINN



New Saito FA-325R-5 is a large displacement five-cylinder four-stroke radial, like recently announced O.S. Sirius, but has totally different cam gear.

SAITO FA-325R-5

SPECIFICATIONS

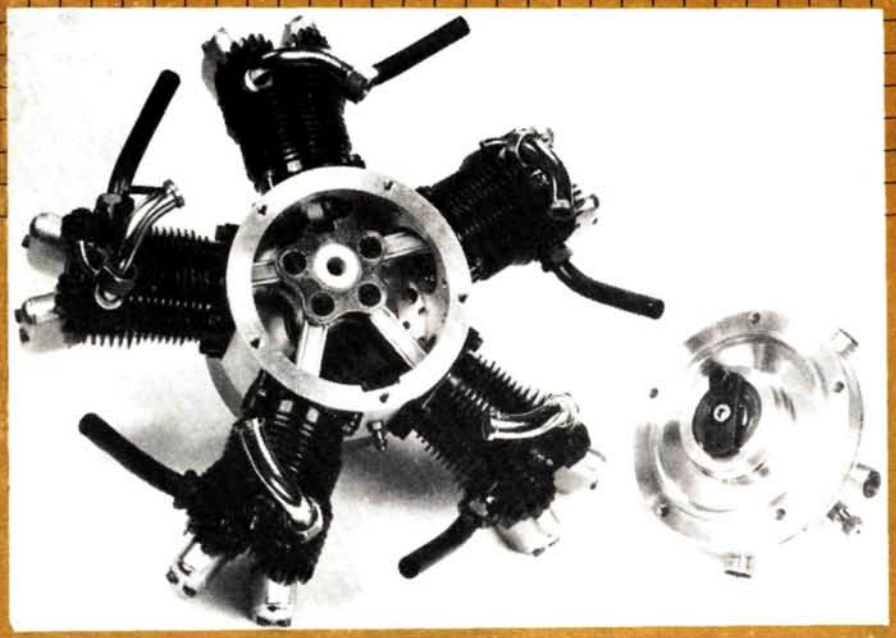
Type: Air-cooled, five-cylinder radial four-stroke-cycle, with pushrod operated overhead valves.
Bore: 24.8 mm (0.9764 in.)
Stroke: 22.0 mm (0.8661 in.)
Displacement: 53.14cc (3.243 cu in.)
Nominal Compression Ratio: 10.4:1 (average of 5 cylinders)
Speed Control: Saito barrel throttle carburetor with adjustable automatic mixture control.
Checked Weights: 2.55 kg (5.62 lb) with exhaust stub pipes; 2.68 kg (5.91 lb) with exhaust collector ring.
Mounting Dimensions:
Overall diameter: 226 mm
Length from prop driver face including firewall mounting brackets: 171 mm
Bolt hole spacing: 100x80 mm
Manufacturer's Claimed Power Output: Not stated
Manufacturer: Saito Seisakusho Ltd., Ichikawa, Chiba Prefecture, Japan.
U.S. Distributor: United Model Products Inc., 301 Holbrook Drive, Wheeling, IL 60090.



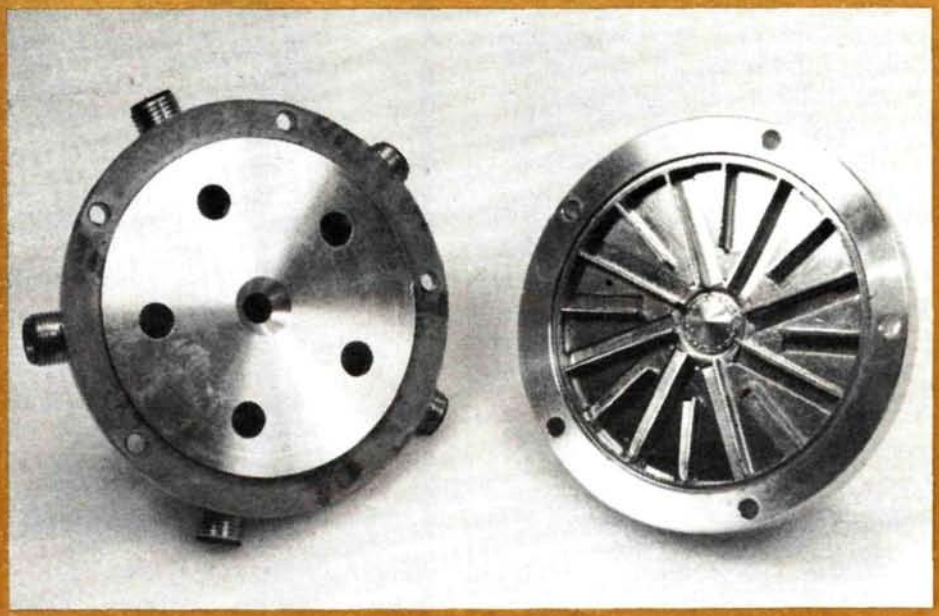
A nice touch with Saito 3.24 cu in. radial is its optional exhaust collector ring. Engine mounting brackets removed for this photo.

HARD ON THE heels of the O.S. FR5-300 Sirius (see *M.A.N.* October 1986) has come another large displacement five-cylinder four-cycle radial, the Saito FA-325R-5. The overall dimensions and weight of the Saito radial are much the same as those of the O.S., but it uses a fractionally larger cylinder bore (bore and stroke are the same as for the single-cylinder Saito FA-65 model) so that it has a slightly larger displacement than the Sirius, i.e., 3.24 cu in., rather than 3.04 cu in.

These two engines are really in a class of their own at the present time. Having the benefit of several years' experience in the quantity production of four-stroke engines, both single and twin cylinder, their respective manufacturers were well placed to produce thoroughly practical multi-cylinder powerplants. In other words, these engines have the power and durability to make them fully acceptable to giant-scale enthusiasts who prefer to use such engines (rather than, say, chain-saw based two-strokes) and who are prepared to pay for the privilege.



Left: Backplate/inlet manifold assembly removed to reveal master conrod assembly. Crank in center of backplate, right, drives special mixer fan. Below: Inlet manifold, left, with mixer fan in its housing, right. Purpose of fan is to improve fuel atomization and distribution.



Outwardly, the Saito is a realistic looking engine, very much along the lines of some of the smaller five-cylinder radial aircraft engines of the 1920s and '30s. Gen Saito, president of the company that bears his name, is, himself, a long-time model enthusiast and has recently been flying a fine model of the Hawker Tomtit biplane in which the Saito radial looks exactly right. The model weighs 22 lb, has a wing area of 12.4 sq ft, and the engine drives a 20x8 prop.

As we have remarked previously, when reporting on radial engines, a slight disadvantage of this type of engine (a problem which model and full-size radials share) is a tendency for residual oil to drain into the lower cylinders when the engine is not running. This can cause a hydraulic lock and possible damage if an attempt is made to start the engine in such a condition, especially if the carburetor intake has been choked. Particularly when starting from cold, the wise owner will always check for undue resistance while the prop is carefully pulled through the engine's compression strokes and will then remove the lower cylinder plugs to drain out any excess fuel.

To alleviate this problem, Saito has made provision for pre-start priming of the upper cylinders only. The No. 2 and No. 5 inlet pipes are equipped with short 3 mm o.d. priming tubes through which, by means of fuel tubes and a Y-branch connector, a small injection of fuel can be made into these two upper cylinders. A syringe is supplied with the engine for this purpose.

A simple method of distributing fuel/air mixture to the cylinders, in a model radial engine, is to use the actual crankcase as a manifold, the inlet pipes radiating from it and drawing mixture through the crank chamber from a centrally mounted carburetor. This has the merit of helping to keep the crankcase purged of corrosive blowby gases, but is otherwise not a very efficient system. Therefore, both the O.S. Sirius and the Saito FA-325R-5 use a separate inlet manifold at the rear of the crankcase. In the Sirius, individual passages in the manifold radiate spirally from carburetor boss to inlet pipe so that residual fuel does not automatically gravitate to the lower cylinders. In the Saito, a different approach is used: a mixer fan, driven at engine speed from the crankpin, helps to atomize the mixture and distribute it evenly to the five inlet pipes.

Although the Saito looks, from the outside, as though it uses normal radial aircraft engine design practice, there is one important area where it is quite different. The O.S. Sirius, it will be recalled, follows orthodox full-size

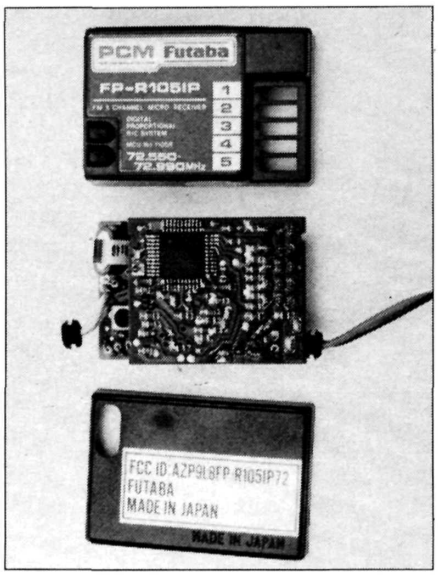
(Continued on page 68)



Control Tower

by CHARLIE KENNEY

I HAD THE opportunity to attend the recent Chicago RCHTA (Radio Control Hobby Trade Association) Show in October 1986 and found a bonanza of new radios at the Futaba* booth. They included an updated series of the very popular Conquest radios which include the 6NLK FM version for the pattern flier plus the new 5NLH helicopter radio system for entry-level helicopter fliers. However, the hit of the Chicago show from a radio standpoint was the new Futaba 5NLP five-channel PCM (Pulse Code Modulation) system. It's really a PCM system without all the "bells and whistles" of the more expensive systems available today. I believe that this product approach will be the start of a big breakthrough to bring the advantages of PCM to moderately priced radio systems. The price of the new Futaba Conquest 5NLP will bring PCM technology to the average flier.



FP-R105iP receiver two-deck construction. Note square chip PCM decoder.

There has been much discussion in the past regarding AM, FM, and PCM modulation, but PCM might bear repeating again for the interest of our new readers.



New Futaba Conquest 5NLP PCM system, five channels, servo-reversing, and Ni-Cds.

Photos by CHARLIE KENNEY

Basically, PCM digitized binary codes (zeros and ones) replace the more traditional method of AM and FM modulation. PCM is a unique advanced system which was originally designed to provide rejection against jamming signals in military equipment yet being able to receive its own coded message. The basic premise of "anti-jamming" has been carried over to R/C in terms of rejecting an interfering signal. Let's talk a little about what PCM has the capability of doing for our R/C hobby.

Pulse code modulation in its simplest terms means that the transmitter signal is encoded into a stream of digital bits. This differs from the other forms of pulse modulation by requiring that the sample values of the signal be quantized into a number of levels and subsequently coded as a series of pulses for transmission. By selecting enough levels or channels, the quantized signal can be made to approximate closely the original continuous signal at the expense of transmitting more bits per sample. The PCM scheme lends itself readily to time multiplexing of channels and will allow widely different types of signals; however, synchronization is always required. This synchronization of the system can be on a single-sample or code-group basis. The syncronizing signal is usually inserted with a group of samples from different channels,

TRANSMITTER FP-T5NLP
Operating System: Two-stick, all channels servo reverse
Transmitting Frequency: 72 MHz bands
Modulation System: PCM FM
Power Requirement: 9.6V Ni-Cd battery (NT-8LP)
Current Drain: 190 mA
Dimensions: 7.0x6.8x2.2 inches
Weight: 1 pound, 13 ounces

RECEIVER FP-R105iP
Receiving Frequency: 72 MHz bands
Crystal Replacement System: Frequency can be changed within the same frequency band by changing the precision crystal.
Intermediate Frequency: 455 kHz
Power Requirement: 4.8V, Ni-Cd batteries (shared with servos)
Current Drain: 15 mA
Dimensions: 1.31x1.98x0.81 inches
Weight: 1.37 ounces

SERVO FP-S138
Control System: + pulse width control 1,520 usN
Operating Angle: One side 45° or more (including trim).
Power Requirement: 4.8V or 6.0V
Current Drain (Idle): 6.0V, 8 mA
Output Torque: 34.75 inch-ounces
Operating Speed: 0.23 second/60°
Dimensions: 1.59x0.79x1.4 inches
Weight: 1.45 ounces

on a frame or subframe basis. You can drop pulses but the transmitter synchronizing pulse train or code group always gets your receiver in synch to get the next set of orders to your servos. A micro computer within the transmitter and the receiver knows the code words. Therefore, it's very difficult to interfere with the signals of a PCM radio unless the interfering source is right on top of you.

The conventional digital FM radio uses one pulse for every servo function which varies in accordance with the transmitter operational control signal. A PCM system starts by using a code word for the first transmitter function, then information follows, consisting of a pulse train which is determined by the stick positions of the transmitter. The microcomputer in the receiver identifies the signal for the function and passes the information to the proper servo only if the code word received corresponds with the one stored in the receiver. The receiver computer is programmed to repeat the information received until the code word is identified and then pass it to the proper servo.

The receiver computer works at a very high speed, and therefore, all information on the stick or switch positions of the transmitter can be repeated at a very high rate in one second. Even if a code word is received incomplete or incorrect several times because of interference, this will not have any adverse effect due to the high rate of repetition.

If degrees of interference are such that the receiver does not get any information which can be identified as "correct" for more than 1 or 2 seconds, a fail-safe condition could be declared and all flying surfaces neutralized and the motor set to low. The Futaba FP-5NLP system fail-safe operates as follows: if the receiver loses the signal for whatever reason—interference, loss of transmitter signal, etc.—the control surfaces are held in the last position before the loss of signal or interference and the throttle servo goes to low. With the return of proper signal, all surfaces return to the stick position being held.

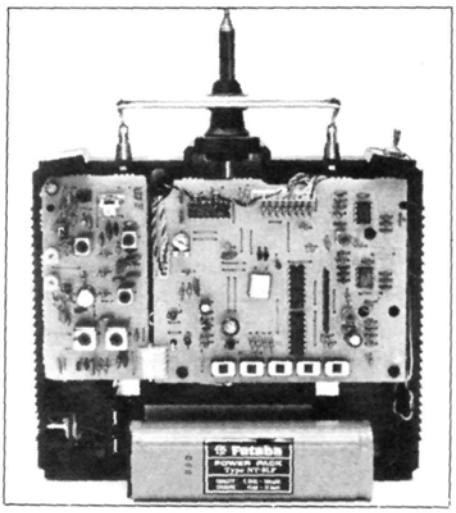
Modulation selection is important if you're aware of known interference signals in your area, such as a high-power commercial broadcast transmitter or paging services. It could be worth your while to contact a local R/C club or hobby shop before buying a radio. However, as a general rule of thumb, PCM is least susceptible to interference followed by FM and AM in that order.

The radio set as delivered consists of the FP-T5NLP transmitter, an FP-R105iP receiver, four FP-S138 servos, airborne NR-4J Ni-Cd battery pack and Ni-Cd charger, servo extension cord, frequency flag, spare horns, and servo mounting hardware.

The system features are as follows, starting with the transmitter which is the heart of every radio system. The Futaba FP-5NLP radio provides a system with a microprocessor in both the transmitter and receiver. Let me highlight the features of the FP-T5NLP:

TRANSMITTER FP-T5NLP

Five-channel PCM transmitter with new one-chip microprocessor.



Business end of transmitter RF section is left, PCM encoder, right. Note five servo-reversing switches.

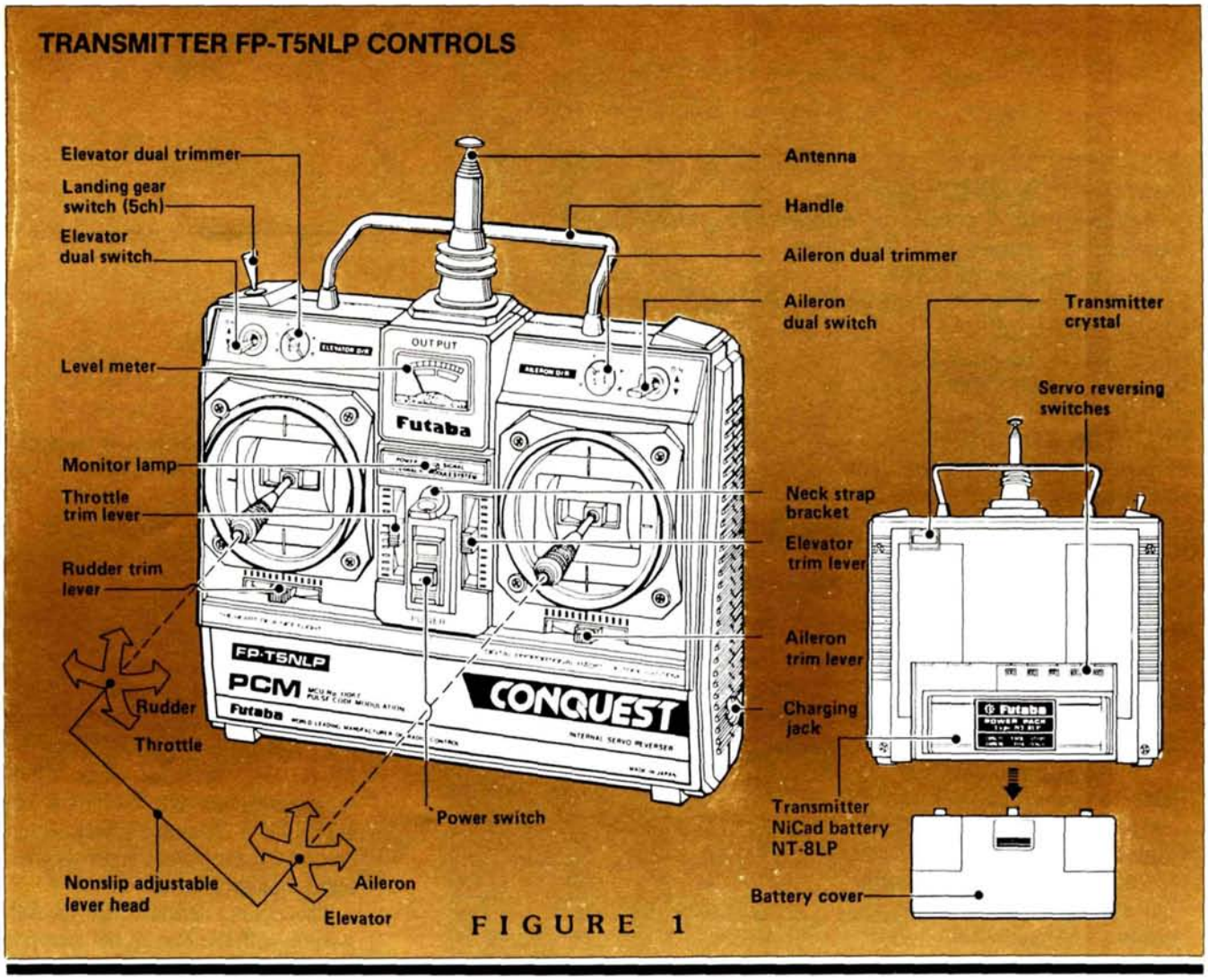


FIGURE 1

- Reliability substantially improved by using robotic (automatic) assembly of the P/C boards.
- Servo-reversing switch for each of 5 channels.
- Aileron and elevator dual-rate features.
- Adjustable throttle limiter (ATL).
- Newest open gimbal sticks provide customized feel. Stick spring tension can be adjusted.
- Non-slip adjustable stick length can be adjusted to match the pilot's requirements.
- Crystal can be changed from external location.
- RF PC board modular design.
- Functional case, created as a result of ergonomic design.
- Easy-to-read transmitter battery voltage level meter and On display LED (light emitting diode).
- Eight-element efficient antenna.

RECEIVER FP-R105iP

- High-performance and reliable miniature PCM receiver utilizing the latest microprocessor technology.
- Miniature PCM receiver with built-in high-speed one-chip PCM microprocessor. Designed to resist adjacent frequency and noise interference.
- High resolution and fast response achieved with Futaba PCM microprocessor software.
- Microprocessor servo hold function eliminates erroneous operation.
- Microprocessor throttle fail-safe function flight safety.
- Inherent PCM system is resistant to adjacent band interference.
- Crystal can be changed within the same frequency band.
- High quality and reliable connectors eliminate contact problems.
- Improved vibration and shock resistance due to through-the-hole plating of the PC board.

SERVO FP-S138—small, rugged, low profile servo

- Height is 0.2 inch lower than existing servos of its type.
- New indirect drive potentiometer improves vibration, shock resistance, and neutral accuracy.
- Futaba low-power custom IC provides extremely high torque, narrow dead band, and superior tracking.
- Fiberglass-reinforced PBT (polybutylene terephthalate) injection-molded servo case is mechanically strong and invulnerable to glow fuel.
- Strong polyacetal resin ultra-precision servo gear features smooth operation, positive neutral, and very little backlash.



Many accessories provided with 5NLP. See text.

- Fiberglass-reinforced epoxy resin PC board with through-the-hole plating improves servo amp vibration and shock resistance.
- Three-pin connector eliminates faulty contact and improves reliability against vibration and shock. Case has a reverse insertion prevention mechanism.
- Special grommet simplifies mounting of the servo and has excellent shock and vibration protection.
- Six special adjustable splined horns are available.
- Output torque is 34.75 inch-ounces and operating speed is 0.23 second/60°. This servo can be used for almost all applications.

All-up weight of the airborne system is 11 ounces.

In addition to the hardware, the Conquest 5 PCM has a six-page instruction manual describing each system element with many drawings and isometric views. Particularly good are the transmitter, airborne system, and servo exploded-view drawings. The heart of the Conquest 5 PCM is the Mode II transmitter so let's start our review there. See Figure 1.

At the top left of the transmitter is the switch for the landing gear (Ch. 5). Switch position for direction of up and down gear movement is at the user's choice. An eight-section telescoping whip antenna is located in the center of the transmitter top and behind it is a convenient carrying handle. Moving to the transmitter front and starting at the upper left, we find the elevator dual-rate switch. Down is Off, up is On. Just to the right of the D/R elevator switch is the dial-calibrated (0-10) D/R adjustment. Clockwise movement of the slotted shaft reduces the throw when the D/R switch is On (up). Full clockwise movement is minimum throw. By turning the elevator D/R switch off, the elevator throw immediately returns to normal full throw. The elevator D/R control can reduce the servo throw to 40% of full throw (100%) centered about neutral. Moving right, we find the rather large calibrated output level meter measuring 1x¾ inches. It is very easy to see. The level meter is equally divided into a calibrated red section and silver section. With a full charge, the indicator needle is three quarters into the silver section. As the transmit-

(Continued on page 99)

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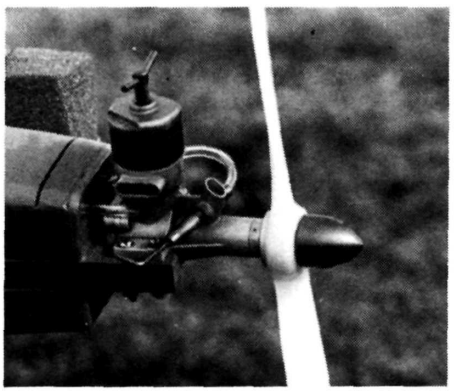
Small Steps

by RANDY RANDOLPH

SMALL AIRPLANES fly every bit as well as big airplanes, but they do have to be light. Light is a relative term, of course, and when applied to small airplanes means they must be lighter in proportion to their flying surface areas than larger airplanes. The number of air molecules that are displaced by a wing is in direct proportion to the lift generated by that wing. Small wings generate less lift per square inch than larger wings because they displace less air. Since air can't be changed, the only thing to do is build lighter airplanes! There are a number of ways to lighten an airplane without sacrificing strength.

The first consideration is the weight of the radio equipment. There is a great difference in receiver, servo, and battery weight from one manufacturer to another. Four-channel equipment can weigh from less than 7 ounces complete to well over 1½ pounds. The larger, heavy-duty servos and battery packs are intended to move control surfaces on big airplanes. They must have reserve power to provide safe, dependable operation under stress conditions, conditions not found in our smaller airplanes. Select the equipment for the job and a considerable savings in weight will result.

Inexpensive systems are available that weigh in the 6- to 7-ounce range for two channels and less than 10 ounces for full-house installations. Move the servos and battery packs fore and aft to achieve balance, rather than adding weight to nose or tail.



Diesel engines have been overlooked in this country for a long time. They have some decided advantages for sport fliers.



This neat Avro Avian by Earnie Harwood is an ideal subject for a small-scale airplane.

The next place to look for weight savings is in the basic structure itself. Most models are made of balsa, plywood, and foam, held together with glue. In the construction of truly lightweight airplanes the use of foam and plywood should be reduced to a minimum.

Although glue is a rather complicated subject, generally speaking almost any glue that is used with balsa is stronger than the wood, so the ticket is to use the lightest glue that will do the job. The lightest glue is model airplane cement, Ambroid or Testers, because a large amount of its weight evaporates during the curing process. Then in order of lightness comes the aliphatic resins and the cyanoacrylates. Epoxy glues are by far the heaviest and should be used only in the engine area where fuel soaking is inevitable.

Next to steel wire, plywood is the heaviest material we use in modeling. There are only a few places in a small airplane that plywood belongs: the firewall, landing gear mounts, dihedral braces, and load-bearing bulkheads. If plywood should be used as a doubler near the nose of the airplane, to tie firewall, wing, and landing gear mounts together, it should be no heavier than 1/32 inch with 1/64 inch usually adequate. A sport airplane that requires heavy plywood doublers in the nose for balance should be designed to have a longer nose, or a much lighter tail. Adding weight to any airplane under the guise of adding strength is no substitute for proper design.

Next time I'll look at the basic modeling material, balsa, but in the meantime here are a couple of small airplanes that represent quite different ends of the modeling spectrum.

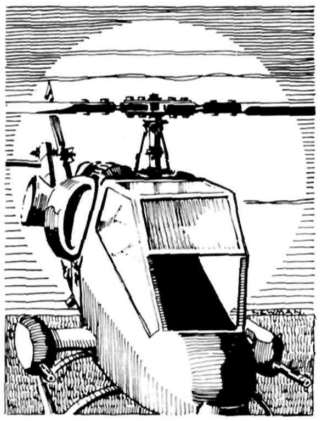
Note the beautiful Avro Avian built by Earnie Harwood. Power is an O.S. FS-20 and performance is as good as it looks. A long nose is a distinct advantage in scale airplanes because it is easier to achieve a proper CG, which in turn makes for an easier-to-fly airplane. Tail-heavy airplanes cause premature aging in test pilots! Four-stroke engines sound great in scale airplanes too.

Earnie Harwood is responsible for the next photo as well, this time a glider, powered by an M.E. Heron .09 diesel. Diesel engines require less support equipment than any other type of powerplant, and are quite popular with free-flight scale fliers. There is no reason that they should not be great for school-yard flying. No battery or starter needed, just fuel and transmitter. Davis Diesel Development* provides diesel conversions for most popular small two-cycle engines, which is an inexpensive way to get your feet wet with compression ignition.

Randy Randolph, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the company mentioned in this article:*

Davis Diesel Development, P.O. Box 141, Milford, CT 06460. ■



Helicopter Challe

by CRAIG HATH

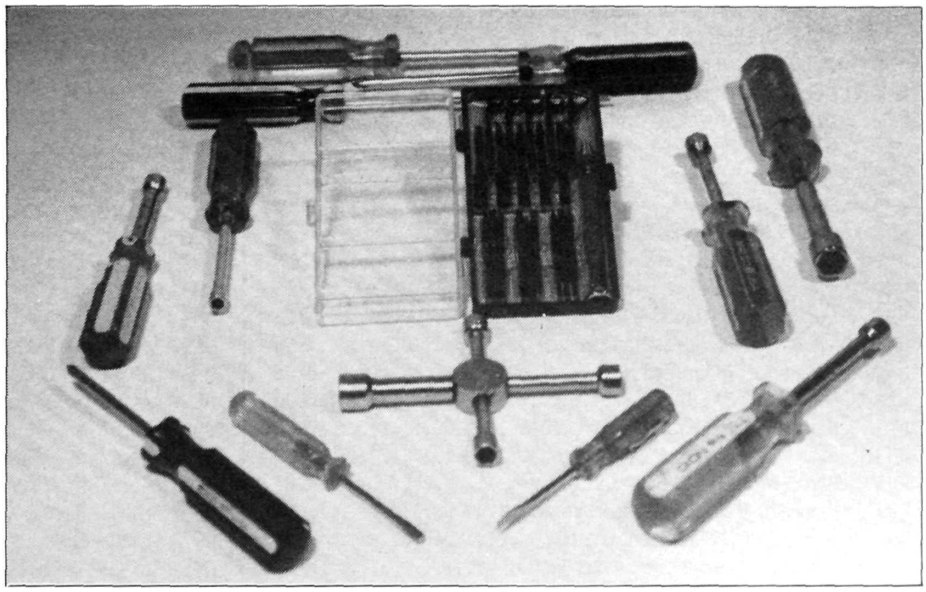
THE RIGHT tool can really make a job easier. This month let's take a look at what some of the necessary tools are, and go into some of the nice additions to your tool collection that can save time and effort when building and repairing.

The Basics

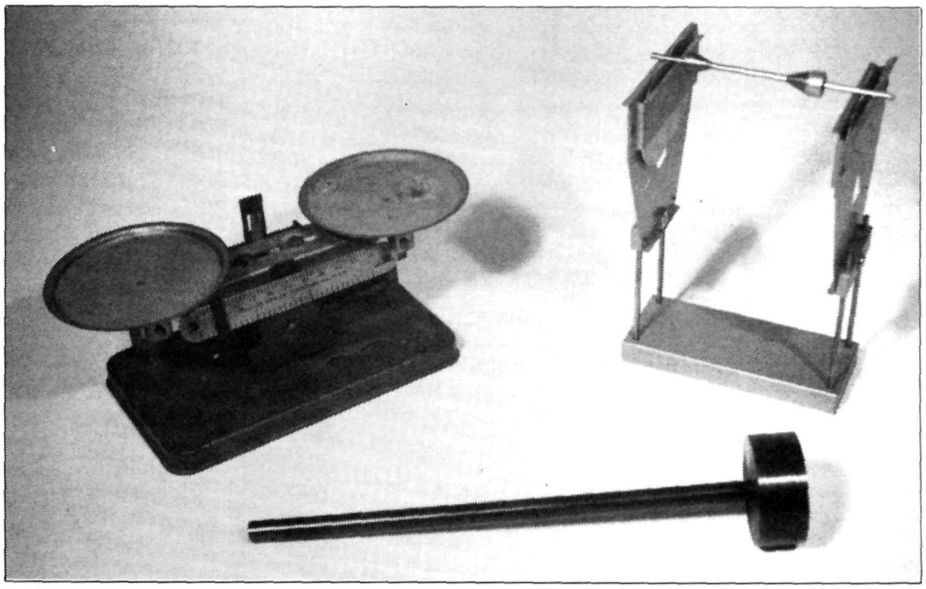
Here are some of the basic tools I would have before attempting to work on the average model helicopter. While building my last helicopter, I paid particular attention to the tool that I had most often in my hands. It turned out to be my hardened-steel 3.5 mm Allen driver, and in close second was my 5.5 mm nut driver. These are the most common screw and nut sizes on today's kits. I have the fortune of owning three different versions of this tool, although only two of them are hardened steel. One of these is available from Yale Hobby Manufacturing*, a firm I've dealt with for some years, and that I'll tell you more about later in this article. The drivers from Yale Hobby Manufacturing are available in 1.5 mm, 2.0 mm, 2.5 mm, and 3.0 mm. These are the perfect sizes for all Allen-head metric bolts and setscrews supplied with most helicopter kits. The drivers are constructed of hardened steel, ground to the perfect size, and are warranted by Yale not to round off. If the tips ever do round off, Yale will regrind the tip free (with the exception of a small return shipping charge). These Allen drivers are not absolutely necessary to build your model, but they are so handy and save so much time that they're really worth the investment.

While on the subject of Allen wrenches, I should mention that most kits will include the sizes of Allen wrenches needed for assembling the model. These are fine, and usually are of good quality. I have accumulated so many of them that I have one section of my tool box filled with wrenches that never get used.

In addition to the Allen drivers, I recommend having a 5.5-mm nut driver for use on the 3.0 mm nylon nuts that are so common. The nut driver should be available through any good tool supply, or larger hardware outlet. If you are fortunate enough to live in an area where there is a discount tool supply, then you should take the time to stop in and investigate the inventory. I've discovered that there are many unusual tools available at these stores, and most of the store operators are willing to order special tools for you. At any rate, don't let the talk of special tools scare you away, as the only



A variety of small hand tools are necessary for proper helicopter maintenance.



Left, a scale used to compare rotor blade weight. Right, the High Point precision balancer for those spinning parts. Foreground, a main shaft and counterbalance used to balance rotor heads on the High Point balancer.

photos by B. HATH, R. TANGREN, and B. PICKENS



The cordless revolution includes the Skil Boar Gun and Sears cordless screw driver.

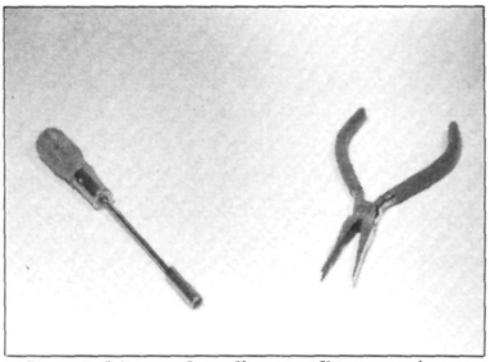
factors that really make these types of tools unusual is that they are metric and they are small.

Some of the SAE (Society of Automotive Engineers which is the standard for the U.S.) tool sizes will fit metric fasteners nearly perfectly. The key here is the word "nearly," as in some cases the fit will not be good enough to prevent damaging the tool or the fastener. A good example of this is the SAE 7/32-inch size in comparison to 5.5 mm. The 7/32-inch tool is so close that I don't think there's much of a chance that it won't fit the bill in our application. I have a set of ignition wrenches from Sears that has come in very handy when I could not find the correct metric wrench.

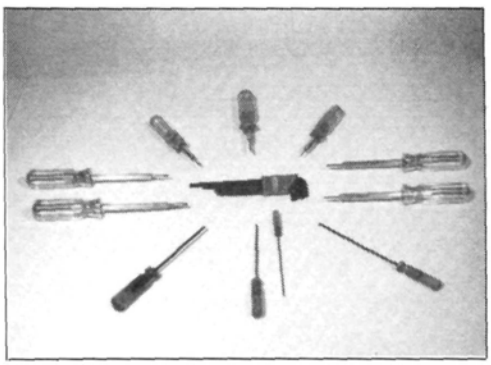
You'll need a good selection of screw drivers. You should have good No. 1 and No. 2 Phillips-head screw drivers, along with a couple of good standard-head drivers. You should also invest in a set of precision screw drivers for the smaller work. I have a set of precision tools manufactured by Tettra which includes an assortment of drivers and wrenches. It seems that the metric Phillips-head screws of the smaller sizes require a driver which has a slightly different shape than the drivers for SAE Phillips use. This means that you'll do well if you find a set of precision drivers which was manufactured in the Orient, as the difference in screw fit is surprising.

Miscellaneous

Some other tools you should have in your collection include a wrench or socket set that will fit the prop nut on the engine, a glowplug wrench, needle-nose and flat-nose pliers, and finally an X-Acto knife. All of these tools are nearly necessities, even if you have to borrow (which can get old fast, for both parties). You'll find that you will accumulate tools over a period of time, so it probably isn't mandatory that you rush out to get all of the tools on your list at once.



Hex nut driver and needle-nose pliers come in very handy.



Some of the author's collection of Allen drivers and wrenches.



An excellent set of metric Allen drivers from Yale Hobby Manufacturing.

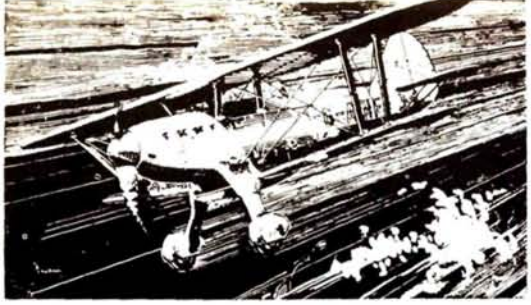
Extra Goodies

Saving time and effort is the issue here, and besides, who in this hobby doesn't like gadgets anyway? In my tool box, there must be over 100 items that never get used; that is, until I try to do something different. These items were accumulated mostly by impulse, but allow me to mention the ones that are most useful.

I think that within the next few years the entire world will go cordless, and the only thing we'll use electricity for is to re-charge our batteries. So, in order to keep up, I've purchased a couple of cordless items that have turned out to be worth their weight in rotor blades. The first is a cordless 3/8-inch reversible variable speed drill with a selectable gear ratio which allows for a low gear for torque and a high gear for speed. This is manufactured by the Skil Corp., and goes by the name of the "Boar Gun." The other item is a cordless screw driver from Sears which features reversibility, and can be locked for hand tightening. These items have found many uses in my shop, and around the house. Along with drill and screw driver, I have collected some accessories and made a few tools that go with them. I made extensions for 1/4-inch sockets, long Phillips and standard screw drivers, and various other things born out of necessity. The extension and screw drivers are made from bargain bin tools that I cut the handles off of and chuck into the drill for use. Sears sells a variety of attachments for the screw driver which makes it a lot handier. I've also cut the bent end off of Allen wrenches and used them in the drill. Use your imagination on this, and you can come up with some fairly creative solutions to fastening problems.

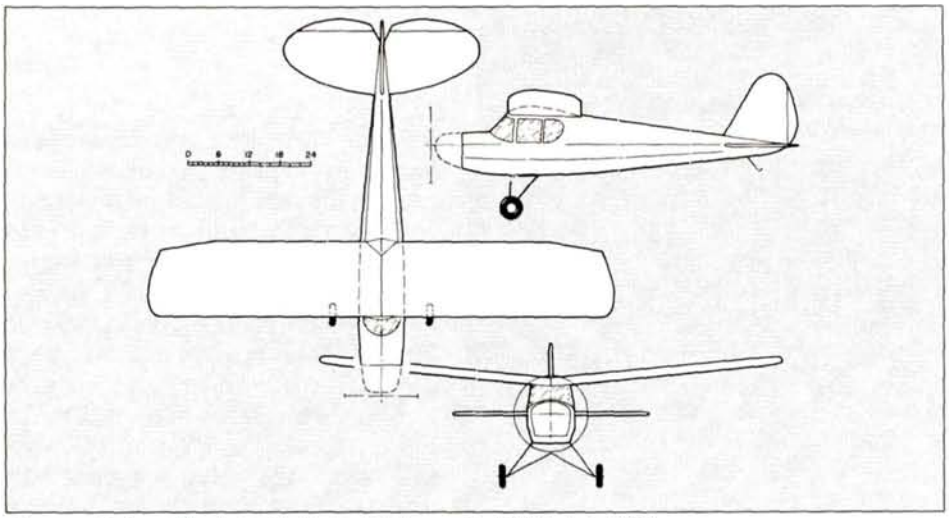
A couple of very useful hand tools you might want to consider are the universal ball-link driver, and the ball-link removers. These are used for assembling and adjusting the universal ball links that connect the linkages on the helicopter. The driver is designed to hold the universal link for adjustment without damaging the link. The removers will snap the link off the ball almost effortlessly, again without damage. These tools are available from most of the kit manufacturers. Mine are

(Continued on page 113)

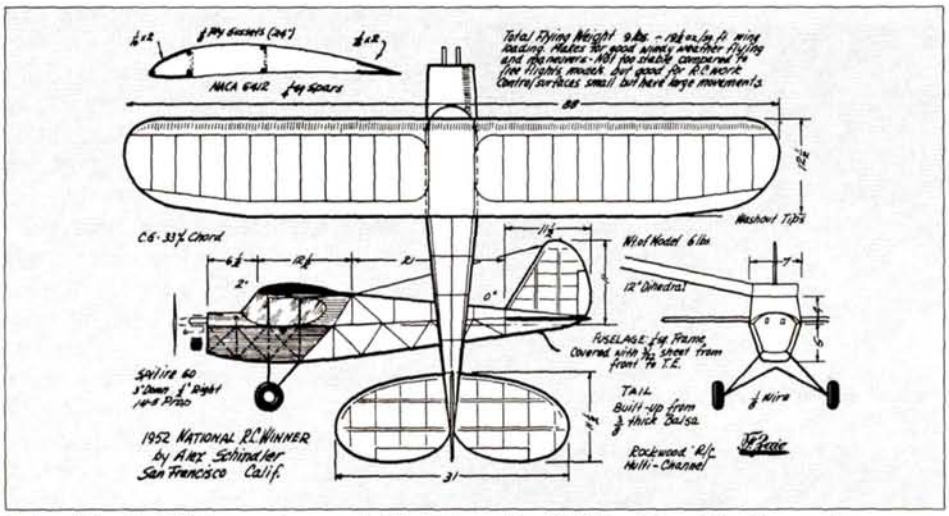


Golden Age of

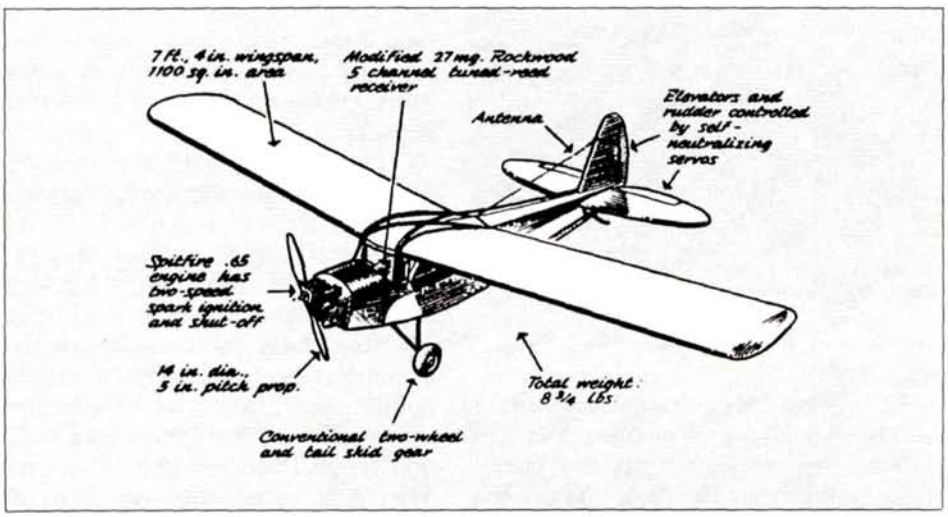
by HAL "PAPPY" deBOLT



Above and below: Alex Schneider's giant Cub won the R/C Nats in 1952.



Below: Schneider's Cub was a large model for that era. Used Spitfire .65 spark-ignition engine.



TO CONTINUE, we've covered the pioneer days of reed systems and the doings of Ed Rockwood and the San Francisco Mustangs club. Remember that it was the Mustangs who did a great deal to show the value of reed, multichannel flying.

In the beginning with all sports and activities, leaders emerge whose efforts are exceptional, showing the rest of us what area of potential exists. As Ty Cobb and Joe DiMaggio in baseball, as Richard Petty in stock cars and our Sal Taibi in free flight along with Carl Goldberg in indoor, with R/C it began with the Good brothers, and then Jim Walker took over for a time. When we come to multi-channel, we have another outstanding personality whose extreme effort showed us the way.

As a member of the Mustangs, Alex Schneider had even more initiative than the others and was a ground breaker whose exploits made his name a model-shop word during those early reed days. As an example, when I entered R/C, Alex was *the man* and had already been flying reeds for three years. He also had already won *two* national championships! He certainly was demonstrating the value of reed multichannel systems, which weren't yet available on a production basis. Alex went on to win a third Nats, commencing what has become a very elite society!

Alex was a typical modeler, a mechanic by trade who enjoyed the challenge of modeling, as we all do. Alex left modeling in 1959 to follow other interests until his retirement. We were happy to have him tell us that his good friend Jack Albrecht recently enticed him back into R/C. Naturally his *first*—Hey, after twenty-five years it's all new again—model had to be a Schneider Cub, which proved to be an excellent trainer for this 70-year-old newcomer! This time around, he has an O.S. .61 four-cycle with Bernhardt ignition for power and a modern Kraft proportional radio. He marvels at what a difference the modern equipment makes, so simple to use, with precise and reliable control.

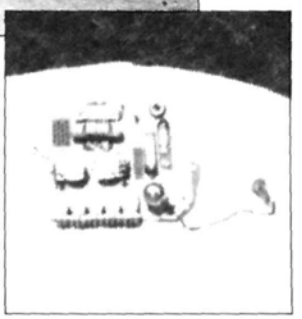
I remember Alex from my R/C Nats in Chicago. Several of the Mustang mem-



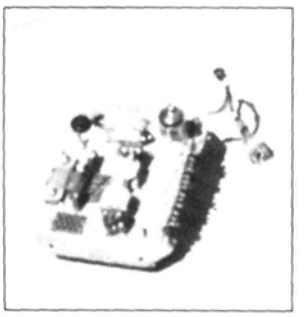
San Francisco Mustangs Club at the '54 Nats. Left to right, Bill Mackerracher, Bob Beckman, and Bill Stelmach.



The man who proved the value of reed multi-channel flying, Alex Schneider.



Home-built Rockwood receiver by Schneider used three tubes and five relays.



Another view of Schneider's receiver. Item at left center is reed bank.



First hand-held reed transmitter designed by Alex Schneider.

bers entered the meet, including Bob Beckman, whom we would all come to know through his Giant Scale writings. At that meet, the Mustang's Schneider Cub entries were most impressive, really different from most other entries. Each flight began with a realistic takeoff (most of the rest were still hand-launching) which seemed to require no effort.

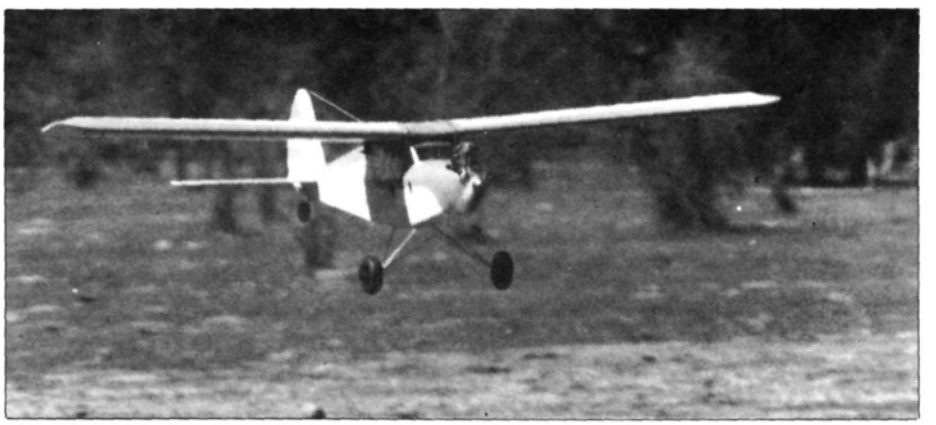
In flight, the big Cubs were graceful and scale-like in their maneuvers. The only shortcoming, if you could call it that: for a scalish cabin design, there was a lack of inverted maneuvers. Otherwise, they just garnered points effortlessly! Before it was all over they managed to give us a good laugh.

Alex was determined to put his Cub into the spot landing circle. On one attempt he was particularly aggressive and did manage to plop it onto the center. On impact the heavy load of the batteries burst out of the fuselage bottom onto the concrete. It was so unexpected, yet an onlooker managed to yell, "Look at that, the Cub is having young'ns!" We laughed, but Alex still got full points! The big Cubs carried pounds of batteries to assure reliability.

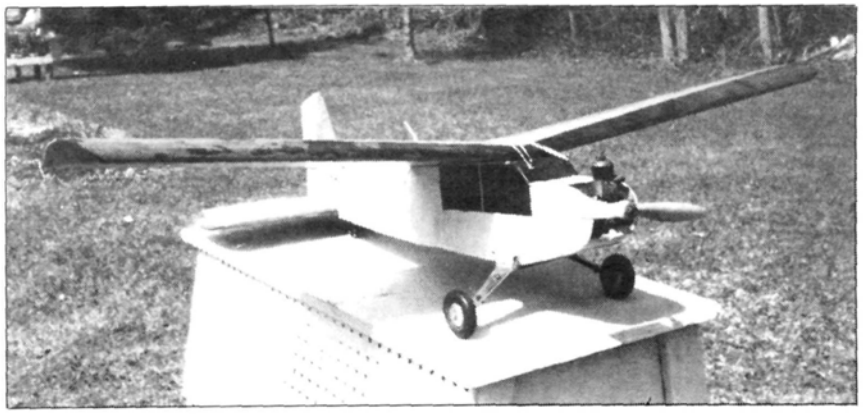
We should tell you that this was the beginning of our own Nats experience, many of which relate to common doings of those times. We came to Chicago with two models capable of inverted performance and thought we were well prepared. Our favorite was a .19-powered Over and Under which we'd demonstrated at the previous Nats, where I was the C.D. The backup was a smaller .15-powered version which really lacked desired power for the heavy reed system.

We went to a designated field for test-flying. On the first hand-launch of the Over and Under the stab caught the back of my neck and the ground impact did some damage. A heck of a way to start. How many of you have had a similar experience? With competition commencing in the morning, do you repair or use the backup? We went the backup route.

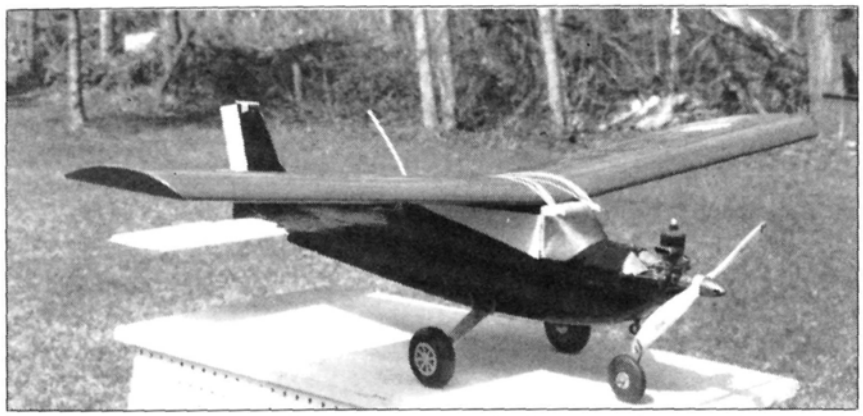
In the morning we checked the radio at



Schneider's Cub, this time of 1986 vintage. Note O.S. four-stroke, a classic touch to a classic.



One of the first R/C kits and still flying, the Midwest Esquire by Bob Williams.



Another ancient Midwest kit, the Tri-squire, still flown by Williams on the original McCoy engine.

the hotel, and an hour or so later were at the starting line for a first flight. Would you believe it, we'd left the receiver turned on. (To fly or not? We flew.) Halfway through the flight the radio quit and the model eventually disappeared in the clouds. Should have ended our Nats, but didn't. The next morning, a Navy helicopter pilot delivered the lost flight line enabling us to start over!

After a change of batteries we were all set, except we needed to tune the control box to the reeds, which is important to do before each flying session. But could we accomplish this during an official flight starting time? We'd see. At the starting line, with wing off, we watched the reeds and tuned. We rubber-banded the wing back on, got the engine going and then launched at the last second!

Finally we were flying and did manage the inverted maneuvers but in the hot weather that little .15 struggled to haul that reed system. It just wouldn't hold out for a complete flight. Such is an example of the weird doings of many modelers in those days of learning.

The Schneider Cub was a famous early multi design which was scratch-built by many modelers countrywide. In this day

(Continued on page 80)

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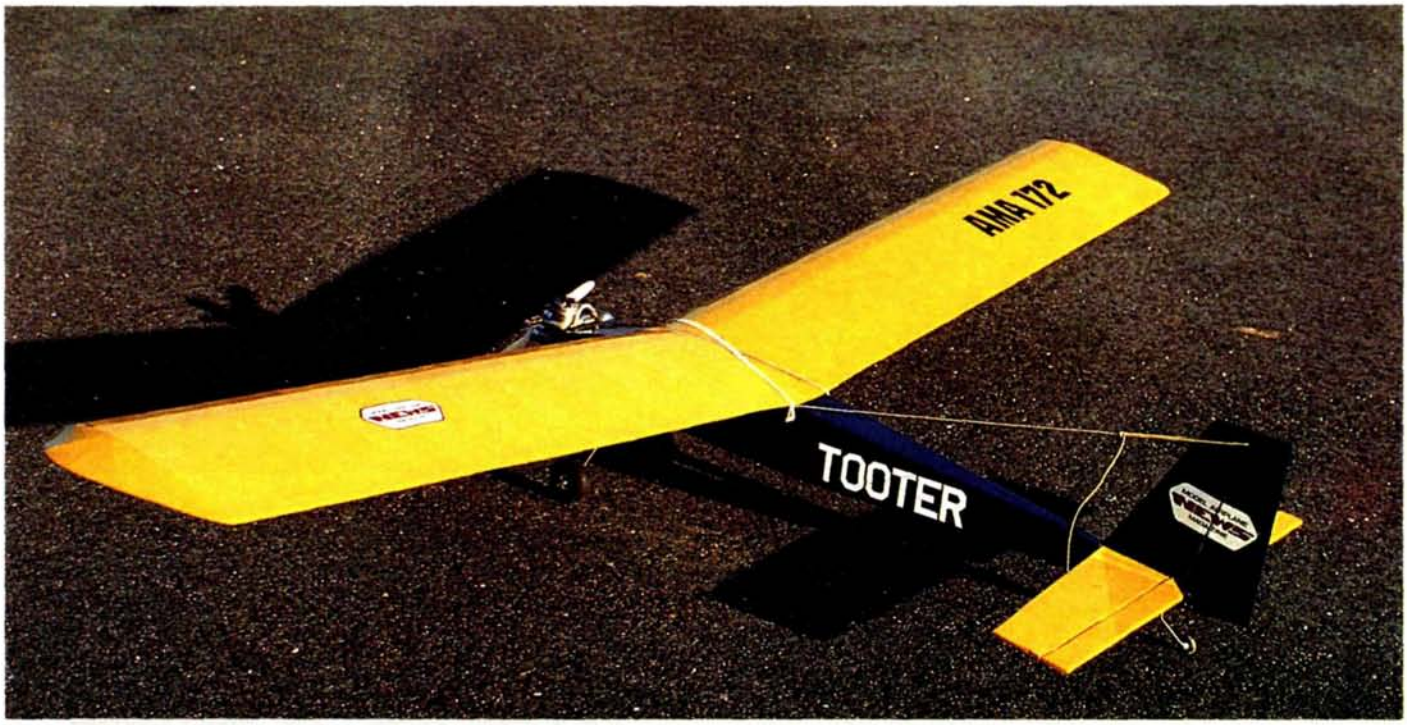
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A trainer that fills a basic need.

by ART SCHROEDER

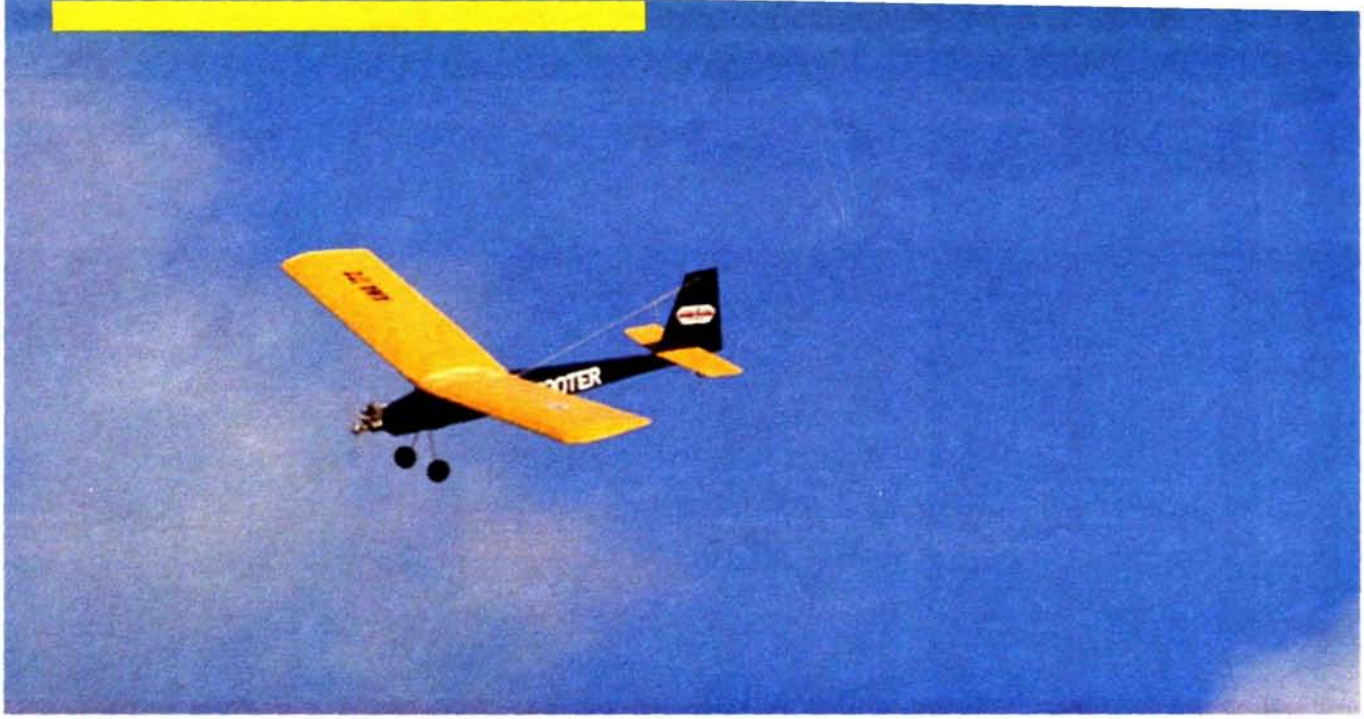
R/C TRAINING airplanes are a very different breed of cat, quite unlike any other airplane. And they aren't easy to design and develop. One might question this statement—after all, trainers look like pretty simple airplanes, so what's the problem?

Simply stated, R/C trainers have a long list of requirements—stability, smooth control response, lightweight but rugged, immunity (relatively) to stalls, moderate speed with constant climb-rate and low sink-rate, absolute ease of construction that is quickly accomplished with an easy repair factor, simplicity with no fussy qualities, alignment ease, low construction cost, and limited attitude change with varying engine speed, and low landing speed with no surprises. A trainer need not bother with streamlining and it certainly doesn't need to be a beauty queen. A trainer must always have the built-in potential to handle control inputs from a transmitter held by a beginner not yet knowing what he is doing! No other R/C airplane has to meet that last requirement.

There is a new trainer around that meets most of the requirements (if not all) and should take its place with some of the classics—deBolt's Trainer and Champion, Sig's Kadet, the Beam of yesteryear, the Apprentice, and even the ARF Trystar. There are some good trainers around because a number of good modelers have given thought to bringing new blood to our hobby/sport. In any event, the new trainer is called Tooter and it was designed by one Jim Bigley (obviously a man who knows what a novice needs).

The Tooter first appeared as a construction article in the September 1985 issue of *Model Airplane News* and it is now available as a kit from Texson Precision Products*. If you decide to try R/C flying and purchase this kit—beg, borrow, or steal (or order one from *M.A.N.*) that September 1985 issue. Jim Bigley's article covers the Tooter's greatest flaw as a kit; the instructions are not what they should be for the absolute beginner and the article will clear up any problems. Otherwise it's a fine kit. Let's look at it.

THE KIT. As it comes, the kit includes saw-cut ribs of appropriate wood, cut fuselage sides, cut wing tips, elevators and plywood parts, all sheet wood, ¼-inch triangle balsa, all hardwood, and dowel straight stock. All material is first rate and not one piece required replacement. There was a problem in the cutting of rib slots for the main ⅛x⅜-inch spruce wing spars. Each rib slot had to be opened by 1/16 inch to fit. If your kit has this problem, be sure to remove material from the rear



of each slot to keep everything in proper compliance.

The hardware kit was also a problem. The gear clamps do not fit the supplied landing gear wire and must be opened to do the job—an easy task with a Dremel cutter. The tailwheel bracket is simply wrong. Go to the hobby shop and obtain a Goldberg* unit. The hardware is quite limited and you will need wheels, collars, nyrods, some music wire, and a tailwheel.

The 4-page pamphlet provided does (particularly when tracked with the article) give a very satisfactory building sequence. My problem with those instructions is that there is nothing visual and little real guidance for anyone who has never before built a model airplane. Fortunately, the plans are excellent and, if you are into plans, that is almost enough. One tip, extend lines on those items that require cutting stock. It's surprising how easy it is to get angles right when you have pencil lines to show where those angles should be.

All glue for this project was Carl Goldberg Models' Jet and Super Jet. I used Jet where joints were tight and Super Jet where some minor gaps needed filling. Don't fuss around with epoxy on this one, the cyanoacrylates are perfect for everything, including the application of fiberglass tape to the wing center section.

A lot has been written about sanding structures and it is important. Your final result will only be as good as the understructure. When the Tooter is sanded out, don't try for airfoil shapes on the tail surfaces: a simple rounding of all edges is enough. Please don't get too vigorous on the wing lest you spoil that great airfoil shape. Sand things enough to remove blips of glue and only enough to provide a smooth covering surface. I do suggest rounding all corners on the fuselage, because it simply looks better.

The entire Tooter structure took 12 hours from opening of the box to final sanding. That sure isn't much time for entry into R/C. Of course, beginners will take more time, but not much more when using cyanoacrylate glues.

I covered my Tooter with Coverite's* Black Baron film. This new heat-shrink is quite easy to use and, so far, it has shown no tendency to release.

Power for the Tooter was an older Thunder-Tigre .15. Although bigger than suggested, this .15 is light and, frankly, I prefer a bit more power for the rough fields and those emergencies when power is needed. The engine runs well, idles nicely, and starts easily; that's really all a beginner needs in an engine.

The instructions indicate that the Tooter can be built as a tricycle-gear airplane. And indeed it can. I don't recommend that however, since the conventional two-wheel gear is lighter and beginners really should learn how to fly "tail-draggers." They are really no more difficult than the tri-gear and, in these days, you'll have something a bit different. On top of that, despite the instructions that indicate the plans would show a tri-gear setup, they do not. So, build the Tooter as a tail-dragger; you'll love it.

The Tooter is a cross between a sailplane and a Sunday sport plane. It has 600 square inches of wing area spread over its 70-inch wingspan. That equates to a wing loading of 9.2 ounces per square foot for its finished weight of 2 pounds, 6 ounces. That loading is sailplane weight and should insure slow flight and quasi-soaring qualities. It all makes for a very easy flying airplane.

One further note, do not beef up any of the structures on the Tooter. What is there is what you need for the rigors of training. Over the years I've found that light airplanes crash a lot better than heavy "logs"! I had a lightweight OT free flight some years ago that had a structure that appeared to be flimsy. T'wasn't so! That airplane took more rough landings (crashes) than any I've had previously. Build the Tooter as shown and you'll have a Class A trainer.

FLYING. The Tooter is really a tutor, meaning that it is supposed to teach you something. That something is really the key to this hobby—how to handle an object that has complete freedom of movement in the air. As easy as it may seem to some, the learning process of controlling an R/C ship can be confusing and downright frustrating if one is trying to learn with an airplane that is either fast-flying or overly responsive. The Tooter is neither, and these qualities will show up when

(Continued on page 96)

1986 LAS VEGAS

Q·S·A·A

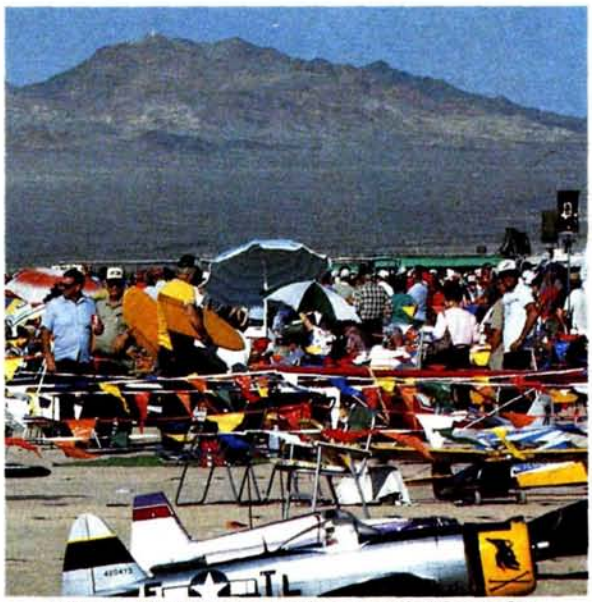
RALLY

by DICK PHILLIPS

FOR THE TENTH consecutive year, several hundred big is beautiful builders assembled on a dry lake bed near Las Vegas, Nevada, in late October 1986. Among its participants were members from many areas of the U.S. and Canada and a growing number from overseas too.

This year's rally saw almost ideal weather, warm, even hot at times, but not the bake-oven weather we've seen in previous years on the lake.

QSAA has developed through the years into a well orchestrated and finely tuned rally. Frequency control and ready box preparations are extremely well done and there are few moments when someone is not in the air. Flying is restricted to five models at any one time, which provides something for the spectator to watch at nearly all times, without causing the pilots any problems with too many airplanes in the air.



The Nevada desert comes alive every October as big bird enthusiasts do their thing.

As is usual with such an event, there are many models that inspire considerable respect for the skill and ability of their builders. One person who continues to astound us with his ingenuity and abilities is Jorg Vogelsang of West Germany. Jorg has managed to attend almost all of the rallies and has brought with him some outstanding example of his skill each time he has visited Las Vegas. This year was no exception. Jorg brought with him this year two Me 163 Komet models whose performance was a revelation to all those who witnessed the flights he made.

To those who recall what the Komet looked like, its stubby shape, limited wing area and control surfaces make it a particularly challenging subject. It would be difficult to fly at any time, and at speeds in excess of 200 mph, it requires consummate skill on the sticks to operate at all.

The Komet flown by Vogelsang is powered with a German pulse jet engine, similar to but larger than the Dyna-Jet many will remember having seen in the U.S. some years ago. The German version is certainly the big daddy of these engines and produces awesome thrust with ear-shattering noise. Getting it past a dB meter would be difficult indeed!

The engine is started by inserting a probe in its muzzle and introducing compressed air and a fuel mixture. Even though you're expecting the burst of sound it produces on start-up, when it happens, you jump from the sudden explosion of noise. The blast from the tail pipe churns the surface of the desert into dust and blows it away.

The model is launched using



Jim Doko's Sopwith Pup was chosen Best WW I.

a bungee hi-start arrangement and requires superb reflexes to control its wild assault on the air. The climb is breathtaking, with the Komet streaking straight up to over a thousand feet in mere seconds. Rolls are made as if the model were strung on a wire—and they're quick! Loops at 200 mph are large but very smooth. The Komet gives the impression of being the ultimate pattern airplane, and it's a scale model to boot!





Above: This great-looking Gee Bee Model Y was built from Haffke plans by Ralph Knight of Riverside, California, flown on Max 240 twin. Left: Sonny Myers' home-built was the center of attention during its visit. Model famous for cyanoacrylate glue ads.



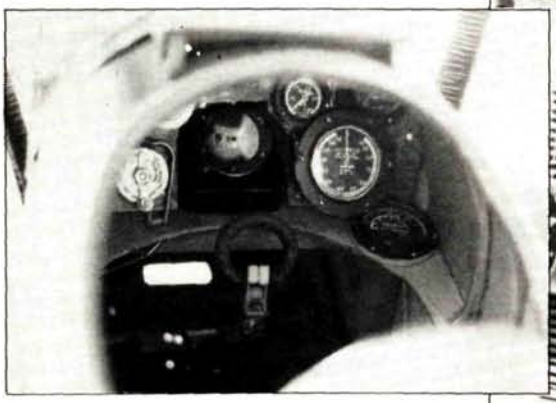
Right: George Vogelsang and crew prepare for an ear-shattering flight of the German Komet, which used a pulse jet engine. Used bungee cord for catapult launch. Below: An all-out effort by the San Gabriel Vally R/C league produced this gorgeous Kinner Sportwing.

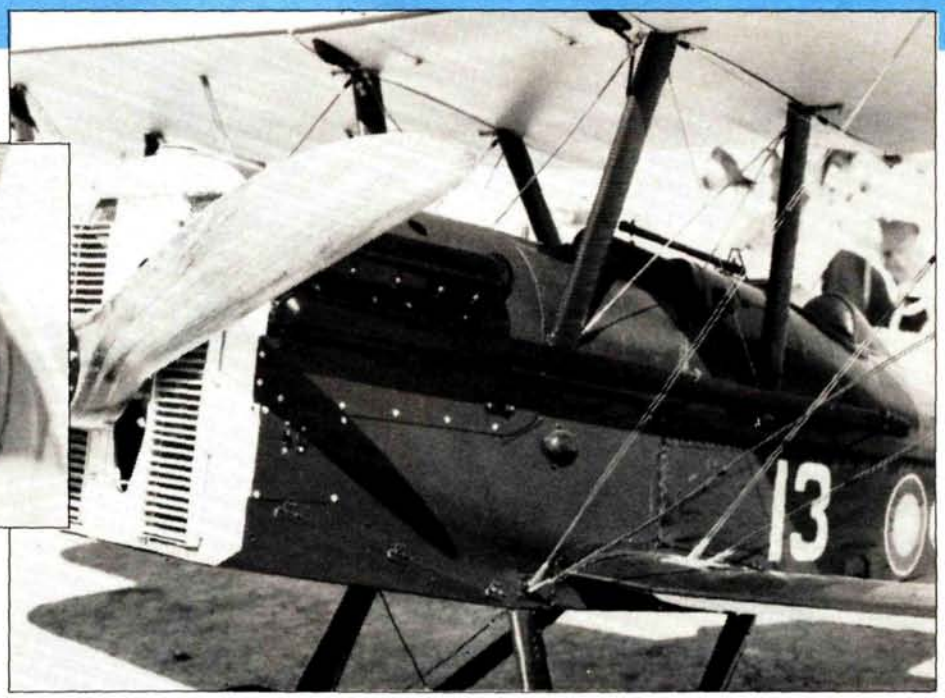
Through the use of adequately large fuel pumps, Vogelsang was able to shut the engine down in flight and restart, much to the delight of those present. Despite its small wing area and apparent heavy wing loading, the Komet has a surprisingly shallow glide and on one occasion Jorg overshot his landing (no problem on the dry lake bed, which is 10 miles long) and landed well out of the landing area. Landing is always deadstick, so there are no second chances.

There are always heartbreaks at Las Vegas. Bob Francis of Aptos, California, lost his beautiful Stuka when its spinner stopped against the ground and the tail of the airplane stomped everything back to balsa chips. The model was extremely well done and flew beautifully. As always, it was a shame to see this sort of thing happen. The Stuka was subsequently voted Best in Scale, so Bob's loss was doubly heartbreaking.



Mel Barber from South Africa is a true gentleman and





Above: Incredible cockpit detail of Dick Enos' SE-5. Right: Of museum quality, Enos's model was not flown but took Best in Static.

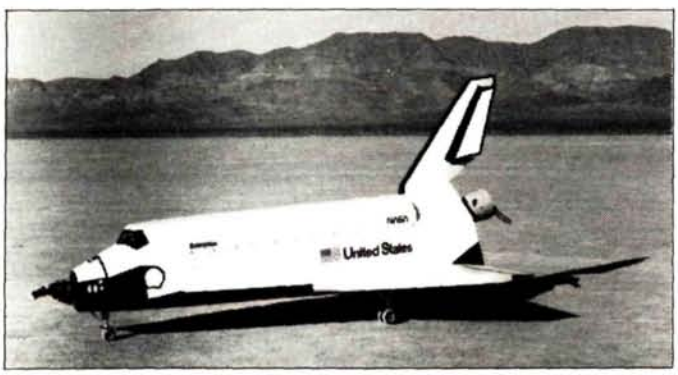
favorite of all who come to the rally. In 1985, Mel had his Sikorsky amphibian with him and an engine problem prevented him from flying. He commented at the time that it was more than a little annoying to travel halfway around the world and only be able to taxi his airplane. Mel's luck ran against him again this year when his model box went astray, ending up in Dallas instead of Las Vegas. Mel says he'll be back again next year, and if his model of Linclon Beachey's airplane turns up, he'll bring it back to asure us that it does indeed exist.

Much of the pleasure in attending such an event is the opportunity to see old friends again. Many of the overseas visitors attend only this one event so it's a once-a-year chance to see them. Many familiar faces are present as well. Hazel and Maxey Hester, the SIG gang from Montezuma, who seem to appear in larger numbers each year and bring more and more vehicles with them each time they come. They brought Claude McClulloch with them this year and it was a delight to see his Waco N model fly. It's beautiful and there were many who expressed the hope that SIG would kit it. Few present recognized the airplane as it is a typical WACO biplane on tricycle gear.

The air was filled with WW II fighters. Jugs, P-51s, P-38s, and P-39s proved their abilities and provided some spectacular flights. A half-scale Crackerjack also was flown (within the AMA 55-pound limit) and proved a stable and very scale-like flying machine.

In addition to Vogelsang's Komet, among the unusual flying machines present was a large space shuttle, intended to be flown as a tractor and pusher engine, with propellers built by Don Westergren of San Diego. The shuttle is 1/15-scale and weighs 23 pounds. Don has tried to fly it but it's a little under-powered and will be flown once the engine power has been increased. Don's good friend and partner, Jerry Howell, is building the companion piece to the shuttle. It's a 13-foot-span Boeing 747, 1/15-scale, and the shuttle and the 747 will be mated as is the case with NASA's full-scale 747 and shuttle. The 747 is 15 feet long and will weigh between 30 and 55 pounds when completed. The engines will be 2 c.i. to 2.8 c.i. outer

(Continued on page 70)



Don Westergren's Space Shuttle will fly in tandem with Boeing 747.



Photo does not reveal the size of this half-scale Crackerjack by Jack Denis of Santa Ana, California.

Floating Around

by JOHN SULLIVAN

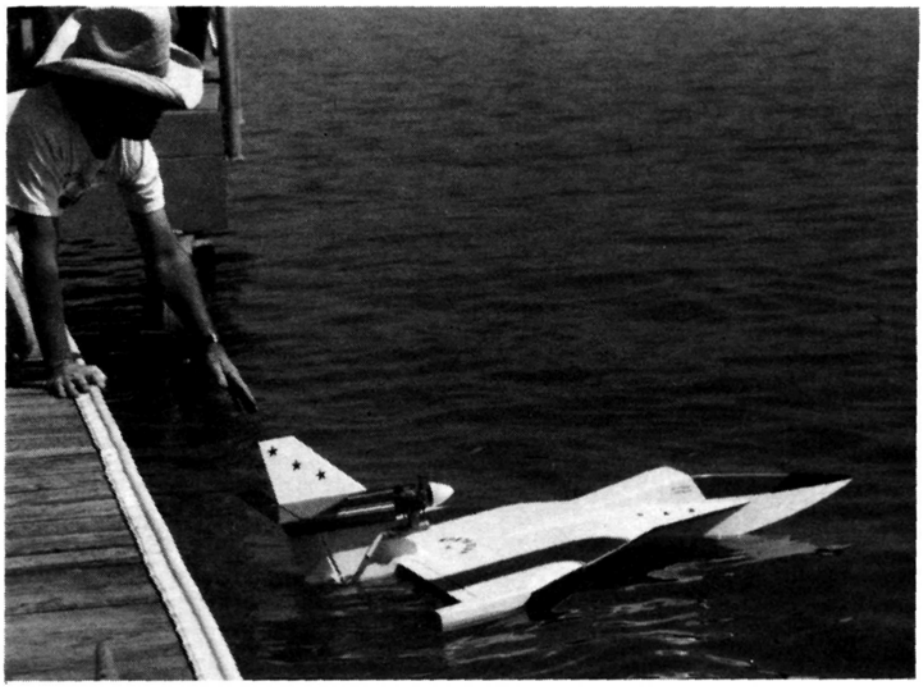
TO ME, flying boats and amphibians bear the same relationship to floatplanes as jets do to landplanes. In both cases the extra work involved ups the ante, the excitement, and the personal satisfaction derived from successfully modeling a more difficult project. This month we're going to take a look at a few of these flying hulls, but before we do I'd like to recommend a book called *Boats Of The Air* by David Wragg and available through Zenith Aviation Books*.

Boats Of The Air is a fascinating account of the history of flying boats and amphibians from the first WW I maritime reconnaissance craft up to today's few surviving members, which include the Canadair Twin, the three-engined Dornier Do. 24TT, and the four-engined turbo prop Shin Meiwa PS-1. The book contains so many excellent photographs that I spent a week paging through it before starting to read. There's even a couple of jets shown, and one of them, a four-engined turbo-jet Martin Seamaster with anhedral wings and wing-tip float/tanks, is sure to start your heart pounding. "Floating Around" says check it out.

One of the latest entries in the flying boat field is Balsa USA's* North Star, designed by Laddie Mikulasko.

I have a soft spot for Balsa USA because I grew up with the owner, Ronnie Bush, in Michigan's upper peninsula. The place is dotted with lakes, ponds, and wide slow rivers in addition to Green Bay, and I'm sure the presence of all that water inspired both of us to combine it with our modeling activities.

The North Star will probably have a great influence on the spread of float flying, owing to the fact that it converts to water use by simply unplugging the landing gear and setting it in your local pond. The models (there's one for .40s and another for .90s) are all built-up balsa with very straightforward construction. No special waterproofing techniques are required for balsa-hull construction, except for the application of Balsarite if you're using iron-on films to insure adhesion, and to lap your covering seams by at least ¼ inch. This kit is a hot seller (250 orders the first week the ads appeared) and a hot performer. The roll rate is one per heartbeat and the speed is blistering, so be careful.

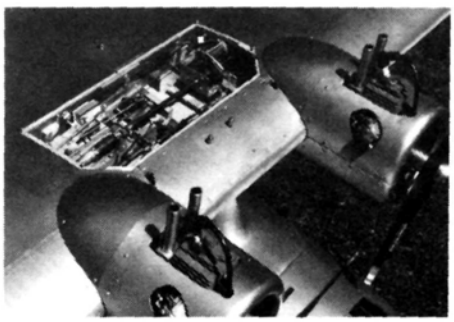


Chris Dellinger's Fox .45-powered North Star is capable of a fully controlled nearly vertical descent.

Next up we have Danny Stanton and his Champion Model Products Kingfisher. Danny also scratch-built the Canadair Twin you saw in the '86 Clearlake report. He tends to refine his planes until they perform flawlessly, and the Kingfisher is no exception. After "more than one" test flight and incidence change, Danny wound up with everything at 0-0, including the O.S. 90 four-stroke, with the CG shifted rearward to 33%. Set up like this, I watched him fly flat, low, close-in 360s with a perfect landing and takeoff each time around at Clearlake.

Danny brings up an interesting point about scale flying boats and amphibians which regards buoyancy. The point is that a scale hull/fuselage will not keep the model buoyant enough unless the model is also *weighted* to scale. I should mention that many amphibians do float surprisingly low in the water with the waves lapping at the side curtains (the Coot is an example). But with any large (read time-consuming) project, it would be wise to check the displacement volume against the model's projected weight. When in doubt, build light.

After talking to Danny, I've found he's built a Republic Seabee and a 1,000-square-inch glass and foam Grumman Widgeon which he plans to fly at Clearlake in 87! I see this guy as "Mr. Amphibian" and hope to feature more of his



This view of the Clearlake Renegades' PBY-5A shows the jackscrew used for retractable wing-tip floats.

models in the future.

The last model featured this month is a Mr. G's epoxy-glass and foam Lake Buccaneer built by Gary Korpi. The Lake is powered by an O.S. Schnuerle 60 with the front plate rotated 90° for reverse running. The fuel tank is located in the fuselage, requiring installation of a Perry Pump with a Robart return valve to handle the vertical fuel draw. Gary says the initial adjustment was tricky, but once a sweet spot was found, the only changes required were slight needle valve adjustments to accommodate major temperature shifts.

The Buccaneer has an interesting design feature in that the removable top hatch incorporates the engine pod, wing, tank, throttle servo, receiver, and battery pack in one unit, with only the rudder and elevator servos affixed to the fuselage proper. This has its good points in that most of the major components are near the top of the fuselage and out of harm's way should any water get inside the assembled fuselage. On the down side, this arrangement requires an effective seal at the seam between the top and bottom fuselage components and the seam is of considerable length. Gary says that if he were to build another Buccaneer, he would permanently attach the wing and engine pod to the fuselage and have the canopy only removable for access.



Danny Stanton's Kingfisher is super stable.

All in all this is a striking model with very good performance. The bad news is that the Mister G's line has been sold to Tiger Models and I no longer see the Lake Buccaneer listed in the Tower Hobbies catalog. This doesn't mean the model is no longer in production, but you may have to snoop around to find one.

An interesting aside regarding Gary Korpi is that he was the only R/C pilot to successfully fly the Army's much-publicized Aquila RPV when it relied on convential gear for takeoffs and landings. After Gary's considerable efforts in flying this 150-pound, 12-foot span beast, the Army decided to launch it on a rail and retrieve the thing by flying it into a net. Such is progress.

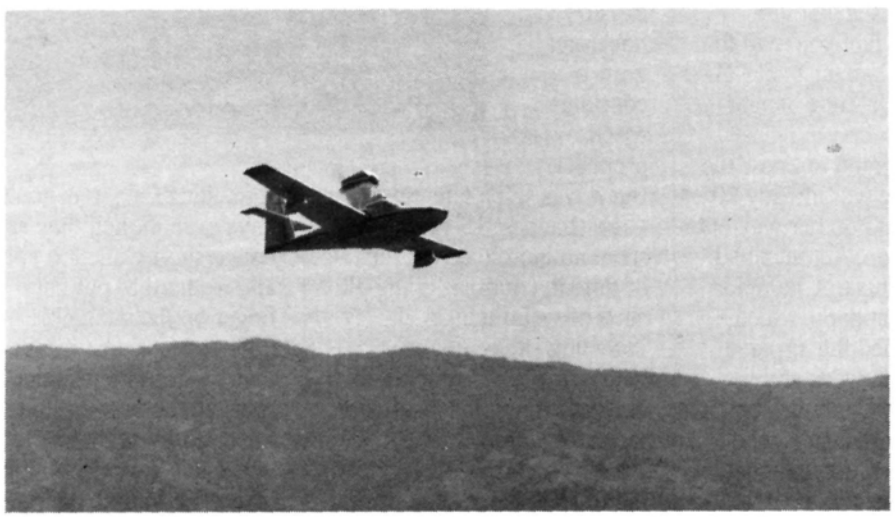
This column marks the end of "Floating Around's" first year with *M.A.N.* and I hope you've enjoyed it as much as I have. Your letters and comments are very much appreciated. Things seem to be getting a little wild around here, what with Gee Bees, Sea Lines, North Stars, and Buccaneers that go like smoke, so for the next couple columns I'm going to settle down a bit and look at trainers and biplanes. Of course, everything will be on floats because that's the only way to fly, right?

John Sullivan, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

Zenith Aviation Books, P.O. Box 1/MN017, Osceola, WI 54020.

Balsa USA, P.O. Box 164, Marinette, WI 54143. ■



Gary Korpi's Lake Buccaneer is a fiberglass and foam model.

STILL A CHAMP

7AC/EC AERONCA

by BUDD DAVISSON





THE WORST part about having old pilots talk about old airplanes is that you know for a fact you're in for a bunch of hangar flying. So, get ready for some hangar flying.

When I came to know the Champ, she was already 20 years old and on her way out of production. Aeronca had sold the rights to Champion Aircraft Company, which later modified the airplane for aerobatic work and it became the Citabria. Then it was sold to Bellanca, who modified the line to include the bush-busting Scout and the butt-busting Decathlons. So, from the beginning to the end, the Champ went from 50 hp to 180 horses and grew a constant-speed propeller. But it was still a Champ.

For the past 15 years I've spent an inordinate amount of time in Citabrias doing all sorts of weird things, including sitting sideways with my feet hanging out the door shooting pictures. But a recent reunion with the Citabria's granddad reminded me of something I had been missing for a long time.

The old 7EC/ACs have something Citabrias don't have even though they are only a short evolution apart, and it's hard to put your finger on the intangible difference. Maybe it's the fact that Champs are simpler souls all the way around. In the majority of them, the upholstery is nothing more than doped fabric and the seats are draped in whatever plastic was available. The



color photos by BUDD DAVISSON

panel is a simple sheet-metal facade, curved forward at its top to meet the back of the boot cowl. Not particularly a high-profile cross-country airplane, the 7AC/ECs were very seldom fitted with radios and none had instruments over and above those to keep the engine running and the FAA happy.

The fuel gauge stared at you from the top of the panel and looked like a surplus unit from a Model A Ford. As a student messing around in 7ACs, trying to convince myself I could actually do a roll in it (I never did), I would sometimes get the bank angle steep enough that gas came running out of the fuel cap vent and back under the windshield, which never failed to scare the hell out of me. However, to this day, when I smell 80 octane, I still think of the old 7AC and picture the view over the archaic instrument panel through the bulging Plexiglas windshield.

Even though Champs are a thousand times easier to board than Cubs, the closest I've ever come to serious injury in any airplane was as an instructor in an old Champion. I stepped out of

The Aeronca Champion is still a pleasure to see and even more pleasurable to fly. Born from airstrips of grass and tin hangars, many an airline captain found in her wings the inspiration and love for things that fly.



The Aeronca and its low price opened up a new realm of pleasure for flying enthusiasts as long as forty years ago and continues to do so to this day.

The Champion will teach you anything and everything about how an airplane really flies.

the back seat and put my right foot on the step, not realizing it had a thin coating of ice on it. As I put weight on it, I slipped and fell out of the airplane, but my left foot hung up under the front seat. There I was, dangling out of the machine with my head and shoulders scraping the ground and my left foot crammed under the seat! I thought I had broken my leg clean off and my student was rolling on the pavement in hysterics. It's terribly hard to maintain any form of dignity when you're dangling upside down out of an airplane on the ramp while begging for help.

A friend loaned me his 7AC for a reunion flight and, as I taxied out, I again realized one of the things that made the Champ so easy to love—it has tremendous ground handling. Even though the heel brakes are a real pain because you can't reach them with the rudder full down, in reality, you don't need brakes for most taxiing and landing. After I became a CFI and spent many hours in the back of a Champ, I found that having heel brakes was a plus for the student, since they could not, in any way, depend upon them for directional control and had to learn to use the rudders.

Lined up on the runway, I brought the power up and in so doing kicked the door open on a flood of memories. As soon as we started to roll, I eased the stick full-forward and the tail obediently came up into the air. *Deja vu* in spades! I certainly had been here before! When the tail is up, your visibility goes from mediocre to excellent, and depending on the wind, the amount of time you get to enjoy the view of the runway varies from short to really short. Because of the well-balanced rudder controls and gear geometry, the Champ has no trouble tracking straight down the runway by itself, however in a crosswind the pilot has to be there with a helpful nudge from time to time.

Once off the runway, the Champ is not known for its blazing climb. However, almost any of them will give you a 400- to 600-feet-per-minute rate, which is actually quite acceptable. In Oklahoma, when it was really hot, one of our favorite tricks was to find a large building, a refinery, or a big field that was generating a thermal and circle up to altitude like a red-tailed hawk.

In the air, the Champion will teach you anything and everything about how an airplane really flies. You aren't messing with attitude gyros or VORs, you aren't hung up with instrument clearances or non-standard holding patterns. The only thing you and the Champ are concerned with is flying—actual, raw, pure flight. For instance, there's no doubt when you're not coordinating. If you aren't feeding in a little rudder with that aileron, you'll see the nose dancing one way or another.

With the combination of the right maneuvers, like pylon eights and chandelles, and the Champ's teaching capabilities, you produce well-rounded pilots who know exactly how an airplane is supposed to fly because they can see and feel it. The Champ talks to them every second and every conversation is a lesson. It lets them know when they are slipping or skidding. It can teach them all there is to know about the airplane's envelope, and conversely open up the pilot's envelope.

While instructing in Oklahoma we did something that is not done by more than a small percentage of the flight schools today—we would teach spins to our private students. The Champ had such a gentle and predictable spin that we took great pleasure in showing students exactly what happened when you cross-controlled a base-to-final turn, since that's where the vast majority of stall/spin accidents happen. We would set them up with a simulated overshoot to final, and let them try to pull the nose around while holding the wings level with outside aileron. The old Champ would obediently snap to the inside of the turn and start spinning very nicely. But it recovered just as nicely. Before our students got their licenses, they knew exactly what would happen, but more important, they knew how to correct the situation should it ever occur.

I used to love low-altitude cross-countries in the Champ. Unless it was winter, we made all these flights with the windows open, which

AIR-KNOCKER

The Aeronca Champion—queen of the two-place airplanes.

by GENE THOMAS

THE NAME AERONCA may be unfamiliar to many model builders, but if you're an old dog as I am and learned to fly 30 years ago in one, the "Champ" may hold a place in your heart as it does in mine.

Certified in 1945 as ATC No. 795, the aircraft was manufactured by the Aeronca Aircraft Corporation. Its selling price was a mere $2,095 and the Champ was indeed a Cadillac compared with its chief competitor, the Piper J-3 Cub. Unlike the Cub, which was designed many years before the Aeronca, you soloed the Champ from the *front seat.* It still had to be hand-proped to fire up the 65-horsepower Continental engine.

While it initially drew criticism on its proportions, because of its squatting posture, few who flew it or had any association with the airplane could hardly fault it in any way.



Gene Thomas and his Aeronca 7FC in early '60s. The 7FC had nosewheel and 100 hp Continental with electric starter, a real Cadillac in the author's opinion.

Later referred to as the "Air-Knocker," the Aeronca underwent a series of changes that resulted in what many of you now know as the Citabria. It remains for me, however, the venerable old Champ—and what a flying experience it was!

Back when I was just out of the Air Force, attending art school, recently married and awaiting birth of my first child, I took flying lessons in the Champ although the full-time job I had after school barely put food on the table. In retrospect, the cost of learning to fly then as compared with today's cost wasn't all that bad at $12 per hour with an instructor and only $7 per hour solo time. With the old Air Corps mentality, everyone soloed in just eight hours—or you washed out.

While suffering from an old Italian disease called *funds-a-low,* it took this young initiate 20 hours to solo, at what was then called Spring Valley Airport (in New York), where one runway was about 1,200 feet long with man-eating trees at one end. Another was about 800 feet long. Anyway, one sloppy rain-soaked day I decided I was ready to solo and went to the airport despite the weather. I talked to the airport owner, suggesting that my instructor was "riding me." The owner, an old boy who couldn't sell a ride that day anyway, said "You know it's raining. The ceiling is low...but I'll give you a chance. Blow it, and you go *five* more hours." (Gulp.) And guess which way the wind was blowing on the short, 800-foot runway!

In the pouring rain the Air-Knocker got us up and around. Hardly able to maintain pattern altitude, I greased the Champ on and the old boy said, "If you can do it in this, son, you can do it in anything!" So, he let me go solo—and I'd need another whole column to describe my subsequent experiences flying *antique* airplanes and, later, USAF jets!

allowed the smell of the fields and the forests to fill the cockpit and make each trip a real emotional adventure. With the window open we could yell out to the farmers and golfers as we went over and they almost always waved back.

I remember one particular low-level cross-country when I myself was a commercial student: I flew about 50 miles across eastern Oklahoma below tree top level in a pipeline cut. God must protect low-time pilots, because I didn't give one thought to the fact that a healthy gust or an unseen power line would have ended my aviation career right there.

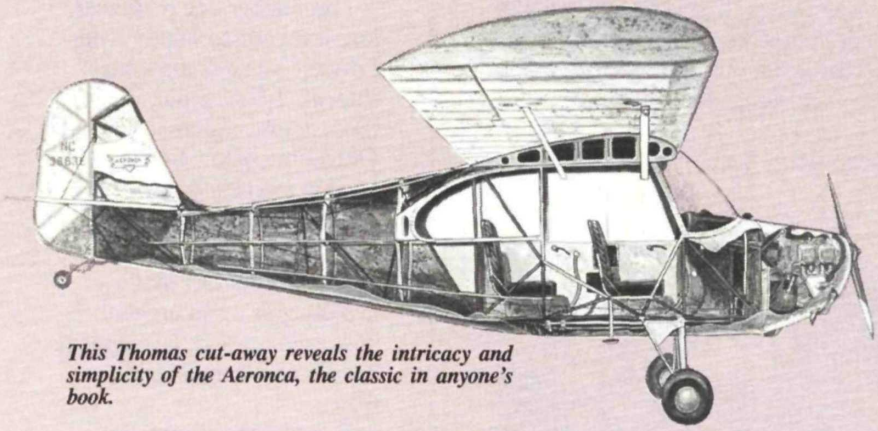
The Champ taught me plenty in those days, and satisfied a lot of my curiosity without breaking any of my bones or letting any of my bodily fluids leak out. Once, for instance, during a particularly tedious cross-country as a student, I began to wonder what happened if you shoved the rudder all the way to the floor. So I slowed down (fortunately) and stomped on the rudder. Well, I don't have to tell you what happened: the old Champ slid sideways and rolled over on her back as pretty as can be. There I was, sucking the stick to my gut in the classic oh-my-God reaction of most pilots in their first split-S. I pulled probably 3 or 4 Gs on the recovery, which sucked the headset down around my neck and sent my heart up to meet it. Like I said, some mightier power than the FAA protects low-time pilots.

When I got around to renewing my acquaintance with the Champ it was the perfect afternoon for such a date. The sun was low, the

AIR-KNOCKER

The Aeronca Champ holds a cockpit full of memories.... Three of us, John Amendola, a well-known aviation artist in his own right, and another fellow, Chuck Tafra, all learned to fly together; we soloed days apart from each other and used to pull a caper we'd all be shot down for now. Renting three Champs, we'd form-up over the then-famous Motel on the Mountain overlooking New York's Hudson, fly over the George Washington Bridge, then down into New York Harbor and around the Statue of Liberty, and one by one land ourselves back at Spring Valley with shameless grins on our faces, knowing that not one of us fledglings yet had 10 solo hours under his belt!

While living on Long Island, I discovered that a small airport called Deer Park had the brand new Aeronca 7FC, a new model with a *nose wheel.* I decided to do the rest of my flying there. Compared with Spring Valley Airport, it was like moving to La Guardia.



This Thomas cut-away reveals the intricacy and simplicity of the Aeronca, the classic in anyone's book.

I found that the new Aeronca 7FC had an *electric starter* and many other features that the Champ didn't have. Though basically the same airplane, in order to keep up with the times, they added the nose wheel to the old "tail dragger" 7AC and to compensate for the added weight and drag, upgraded the powerplant to a 100-horsepower Continental engine. The basic airplane performed the same way, but it was a pleasure to fly compared with the 7AC, if only for the electric starter, and it was easier to land as well. You had to *dance* on the rudder pedals for the tail-dragging 7AC.

A magnificent airplane, the Champ through numerous modifications rendered newer models such as the 7BC, 7CC, and 7EC Tri-Con, the last having a *mid-fuselage tail wheel* which didn't work out too well, as the airplane had to land in a nearly perfect three-point landing—otherwise, the mid tail wheel would be beaten to bits! As you may know, the angle of attack on landing an airplane is nose-high, and well, this mid-fuselage wheel sort of got in the way of anything less than a perfect landing and was therefore soon discarded. But you couldn't knock it, it was progress.

With more specifications than can be listed here, I refer you to *Volume 8, U.S. Civil Aircraft* (Aero Publishers) "A.T.C. 759," p. 204.

The aircraft cut-away presented here was done by your writer and originally published in *Flying* magazine years ago.

This predecessor to many later designs had an original paint scheme of cream and orange. The Champ probably has the same fuselage of welded steel tubing. The wings originally had ¾-inch wooden spars with aluminum ribs and was probably one of the first airplanes to use *screws* rather than the common *rib stitching* to keep its fabric intact. (I wonder which is worse?) The airplane was certified with EDO Floats, Model 1,400, requiring the addition of dorsal fins to its horizontal stabilizer. Nonetheless, a magnificent airplane, often fitted with skis, too; and there was hardly anything to complain about regarding Champ's performance as a snow-slider.

As a model airplane it has a high-aspect-ratio wing, a feature overlooked by many model builders. When flown in any scale this type of wing would make a docile, easy-to-scale model. And, finally, with its simple cowl, easy struts and original paint scheme, it's easy to detail this model—one that just might be a contest winner. Happy landings! ■

Power: *65-horsepower (@ 2,300 rpm) Continental -8 or -8F engine*
Length: *21 feet, 6 inches*
Height: *7 feet*
Wing Span: *35 feet, 2 inches*
Wing Cord: *60 inches*
Wing Area: *170.2 square feet*
Airfoil: *NACA 4412*
Empty Weight: *710 pounds*
Gross Weight: *1,220 pounds*



Cockpit view of the Aeronca shows instrumentation which is the bare minimum. Note seatbelts around stick during ground storage. Thomas photo.

AERONCA CHAMP

air was smooth, and spring foliage was just starting to cover the hills and valleys. I cruised around at 1,000 feet and was enjoying the moment, not because it recaptured something that had gone before, but because the moment itself was something that was worth living.

I hate to break afternoons such as that one, but the sun was going down and I knew the owner must be getting anxious so I topped the last ridge line and worked my way back toward the airport.

Abeam the end of the runway, I found the habits of years ago were still with me as I unconsciously pulled the carb heat, brought the power back, and reached up above my shoulder with my left hand to slide the trim tab against the back of the slot. The airplane knew that habit and as the speed fell to 65 mph, the nose obediently dropped to an attitude that would hold that speed.

(Continued on page 68)



Four-Cycle Forum

by ELOY MAREZ

THE SUBJECT of two- versus four-cycle engine interchangeability and power comparison is not new, nor, for most, close to being resolved. This month we have some very interesting input on the subject from Don Kelton, who is lucky enough to enjoy year round flying in Florida. Don writes:

"I have purchased three four-stroke engines over the last couple of years but never seem to have the time to build a new aircraft for them. Since I was getting very anxious to get one of these beautiful engines into the air, re-engining a well-used 1/16-scale Sig J-3 Cub with the Saito FA-45 seemed like a reasonable way to go. (The plans for the J-3 say that the aircraft can be powered with .19 to .35 cubic inch engines.)

"Since I already had the Saito 45 engine, and have a tendency to over-engineer things, this time I decided to just install the four-stroke engine and see what happens. As a result of this somewhat harrowing experience, I have developed some definite opinions concerning the interchanging of two-stroke and four-stroke engines. The re-engined J-3 was previously powered by a .40 two-stroke and is probably a bit heavier than the average Sig Cub due to mishaps in its earlier life as a floatplane.

"The Saito engine was broken in on the test bench, installed in the aircraft and taken out to the field to fly. To say that the first takeoff was exciting would be a gross understatement. I expected at any time during the takeoff run to have to trudge across the field and pick up 4x8-inch rectangular pieces of Cub which had been strained through the fence. But somehow the aircraft beat, banged, and bounced itself off of our rough field and picked up a little speed. Once airborne (and with full power), the aircraft behaved very much like a full-scale J-3 Cub, but at partial power settings the aircraft had a very nasty habit of snapping into a tight spin from which it was difficult to recover. Flying this aircraft was more work than fun.

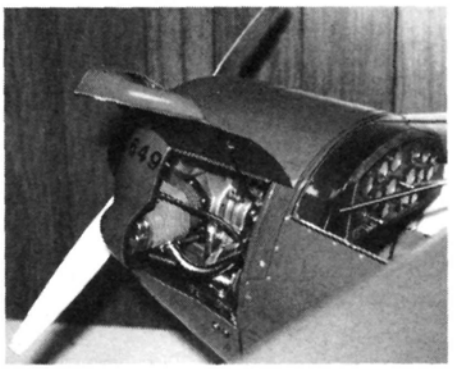
"Since flying R/C airplanes is supposed to be my hobby and not my work, I decided to go back to my old ways and approach four-stroke re-engining in a slightly more scientific manner.

"In order to compare the relative efficiencies of various four-stroke model engines, I have used the data presented in Peter Chinn's "A Four-stroke Engine Survey" (*Model Airplane News*, November 1985) to calculate maximum power-to-weight ratios for many of the engines now available in the U.S. Producing an engine which develops a great deal of power isn't particularly impressive, but building a high-powered, reliable engine which is light enough to power a model aircraft and capable of being mass produced at a reasonable cost is quite an accomplishment.

"I realize that maximum power output is not the whole story; however, my data shows that certain engines are really outstanding in their particular displacement classes. For example, the Enya 46-4C, O.S. FS-61, Enya 80-4C, O.S. FS-90, and O.S. FS-120 appear to have the potential to be outstanding performers. This data indicates that I didn't make a very wise choice concerning which engine to buy.

"If someone is contemplating changing the engine in an existing aircraft from a two-stroke to a four-stroke, the comparison of the power-to-weight ratios for the various engines available in the desired displacement class could be time well spent.

"Engine *thrust* is still the bottom line. It is recommended that anyone re-engining flight-worthy aircraft, first take the time to measure the installed two-stroke engine thrust (with a spring scale, fish scale, or similar means) before removing it from the aircraft. The installed four-stroke thrust should then be measured after engine installation. It is desirable to check the thrust with several different brands and sizes of propellers installed. I have obtained varying thrust values for propellers from different manufacturers with the same pitch and diameter. If the thrust developed by the four-stroke is fairly close to that of the replaced two-stroke, and assuming that the aircraft was not constructed from bricks and manhole covers, the aircraft should fly.



Some important information on the Kavan FK-50, nestled here in Larry Griffin's Beech Staggerwing, is contained in the text.

"From my experience with the J-3 Cub, one might assume that I am not happy with the Saito FA-45. Not so. This is really a fine-running engine. I simply have to find the right aircraft for it. Carburetor adjustments don't appear to be very critical. It seemed strange to me that there were at least twenty clicks on the high-speed needle valve between obtaining a rich or lean mixture.

"I'm currently the president of the Martin County Modelers Club in Stuart, Florida. Our flying site is located in Hobe Sound, between Stuart and West Palm Beach. If you're ever in the area, please give me a call. You would be welcome at one of our monthly meetings or at the flying field."

Last things first, while the invitation to visit Don's club is obviously intended for me, I've included it here for those of you who might be visiting in the WPB area, or who may live there and be looking for a club to join. Don's phone numbers are: 305-845-5300 work; 305-626-5352 home.

Presented here are the fruits of his

DON KELTON'S FOUR-STROKE FINDINGS

ENGINE MODEL (FOUR-STROKE)	DISPLACEMENT (IN^3)	WEIGHT (OUNCES)	MAX POWER OUTPUT (BHP @ RPM)	MAX POWER TO WEIGHT RATIO (BHP/OZ.)	MAX POWER TO DISPL. RATIO (BHP/IN^3)
HP VT-21	.211	11.4	.24 @ 12,250	.021	1.14
O.S. FS-20	.217	9.28	.31 @ 12,500	.033*	1.43
Saito FA-30	.303	11.7	.37 @ 12,000	.032	1.22
Enya 35-4C	.358	12.4	.45 @ 11,000	.036	1.26
Saito FA-40	.402	12.5	.46 @ 11,300	.037	1.14
O.S. FS-40	.396	12.0	.46 @ 11,200	.038	1.16
Enya 40-4C	.405	13.0	.47 @ 11,500	.036	1.16
Webra T4-40	.393	13.4	.44 @ 12,000	.033	1.12
Saito FA-45	.457	14.0	.51 @ 11,400	.036	1.12
Enya 46-4C	.458	14.5	.72 @ 13,200	.050*	1.57
O.S. FS-60	.607	20.8	.62 @ 10,500	.030	1.02
Enya 60-4C	.607	21.9	.84 @ 11,800	.038	1.38
O.S. FS-61	.607	20.6	.89 @ 11,500	.043*	1.47
Enya 80-4C	.769	21.2	.98 @ 11,000	.046*	1.27
Enya 90-4C	.911	29.0	1.28 @ 12,000	.044	1.41
Magnum 91-S	.908	30.8	1.14 @ 9,100	.037	1.26
O.S. FS-90	.912	24.4	1.32 @ 11,500	.054*	1.45
Webra T4	.873	36.7	1.10 @ 11,200	.030	1.26
Saito FA-90T (twin)	.914	28.4	.93 @ 9,800	.033	1.02
O.S. FT-120 Gemini (twin)	1.215	36.7	1.30 @ 10,000	.035	1.07
Saito FA-120	1.217	32.4			
O.S. FS-120	1.218	27.2	1.76 @ 11,000	.065*	1.44
Enya R120-4C	1.216	32.6	2.00 @ 12,500	.061	1.64
Technopower 7 Rad.	1.35	32.2	.82 @ 8,200	.025	.61
Technopower Big Bore 5	1.39	25.3	.85 @ 8,200	.034	.61
O.S. Gemini 160	1.618	42.2	1.96 @ 10,400	.046*	1.21
Saito FA-270T (twin)	2.75	77.			
Kavan Twin 50cc	3.00				

Note: * indicates engines with outstanding power-to-weight ratios.

labors—very interesting reading indeed, and if you don't save all of your issues or columns, you should save this one. Thanks, Don, we all appreciate you taking the time to share the results of your findings with us. It bears out what I've said before, that I like to think of "FCF" as a place for us to meet and discuss our successes, and failures. This is more important while we're all in the learning phase with four-cycle power, it's simply impossible for any of us to experience it all—so let's pass the word.

Interestingly enough, in March I answered a letter from a young lady in Pennsylvania who inquired about the advisability of equipping the Cub Don writes about with an O.S. 40-FC. I advised against it, and promptly heard from a number of you who told me in various polite but nonetheless firm ways that I had goofed. Not having the time to prove my previous theories by building a J-3, though I'd love to, I didn't pursue the matter any further. It's nice to know that I wasn't altogether wrong, at least in the skies over Florida.

The Kavan FK-50 was the subject of an excellent review by Peter Chinn in our August issue. I have to add something based on my own experience with this excellent powerplant, simply: DON'T USE AUTOMOTIVE OIL IN THE CRANKCASE!

I know the instruction manual says that you can, but I have now seen three engines full of a strange globular jelly-like substance in the crankcase and inside the valve covers. At the same time, the piston rings were seized in their grooves, and there was more carbon in the combustion chamber than I ever see in engines which have been run with castor oil in the crankcase.

I'm not sure exactly what the cause of the problem is, though it is obviously a matter of incompatibility between the various fluids that are going through the engine. Maybe the automotive oil used had some synthetic that didn't like methanol, or maybe the fuel included a touch of nitro, which I recommend as I find it improves starting and idling slightly. Any-

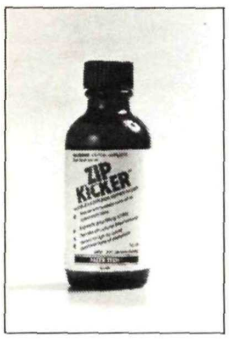
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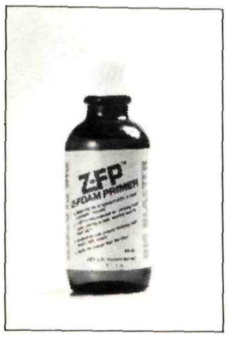
Tech Tips

How To Use Pacer Products

by CHRIS CHIANELLI









OVER THE past few years I've written many articles on aircraft engines, radios, and various other hobby-related products. As of yet, little has been written about how to use some of the support items that we so often take for granted. Adhesives are one of these support items. I receive many letters and am asked quite frequently *how and where should I use my favorite adhesives,* so I thought this might be a good place to hold a class on the do's and don'ts of modeling with super glues. In this particular case I am singling out the Pacer* Zap line of products, only because I've used them for many years and I'm familiar with their idiosyncracies. I've also found there's a fantastic shelf life for Pacer products. However, I do believe that most of the information I'm about to give you will apply to similar formulas of other companies' super glues.

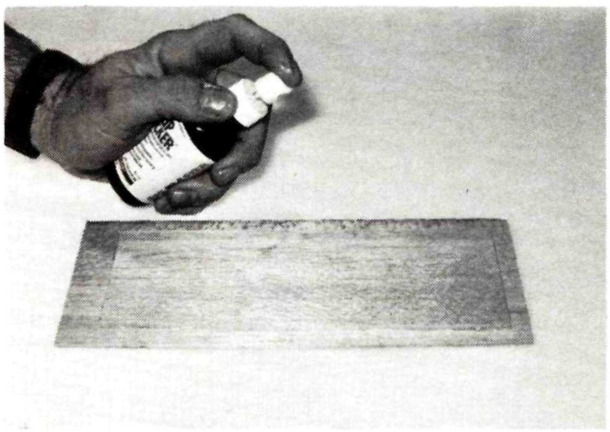
There are two major reasons for using cyanoacrylates (CAs) for hobby construction, a savings of time and weight, without giving up the insurance or dependability of strong glue joints. I realize that many of my fellow modelers still use white glue and epoxy for the bulk of their construction and I will say that the intent of this article is not to convert these people but only to make them, as well as people who *do* use CAs, aware that there is a definite time and place where you may or may not use certain Zap products.

Zap CA

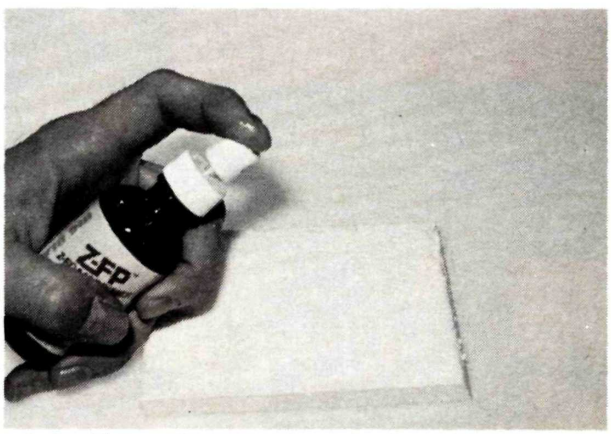
Zap CA is packaged in a pink bottle and is considered the hottest of all their formulas. Zap bonds almost anything in seconds, so you don't want to use it unless you're absolutely positive you want the part to stay exactly where it is when you apply the glue! Zap CA is best used on balsa-to-balsa parts such as wing ribs to spars, formers to crutches, and the like. The nice thing about Zap CA is that it is so thin that you can assemble and hold the parts in position, put a little glue on the joint, and the capillary action will suck



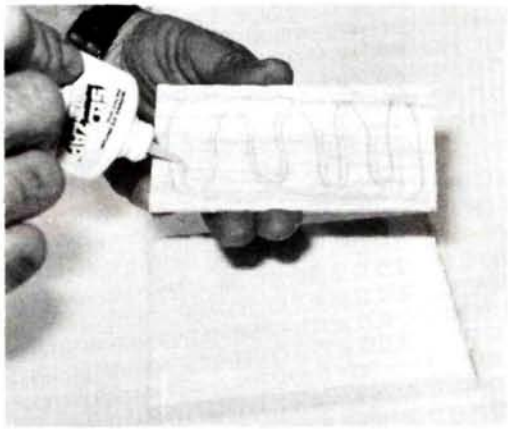
To laminate two sheets of balsa, apply Slo Zap to one sheet, as shown...



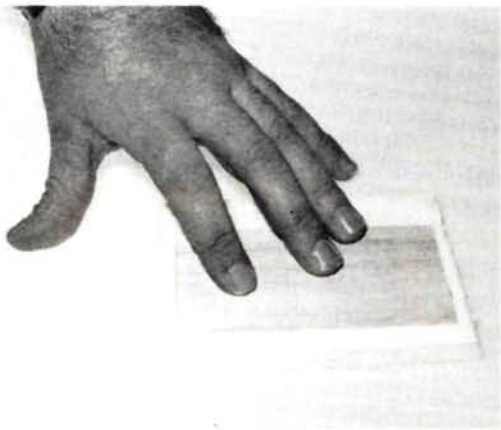
...then, after placing sheets together, use Zip Kicker to hit the edges where some Slo Zap should be squeezing out.



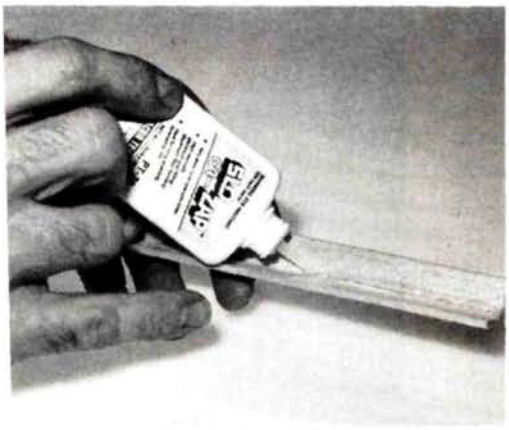
To bond balsa to foam, start by priming foam with ZFP and let partially dry...



...then apply Slo Zap to wood in pattern shown, or a similar pattern...



...then mate wood to foam. In this process do not use Kicker.



Where parts meet at a 90° angle, small glue fillets are easily achieved by using Slo Zap...

the Zap into the balsa's pores and bond the parts instantly. You must have a very close fit for the glue to work properly. Zap CA is so thin that it just will *not* bridge a gap created by poor-fitting parts.

Another use for this product involves tacking. For instance, when positioning a part that will be glued at a later time, a drop or two of Zap CA will hold the part in place for measuring purposes, but the part can easily be removed and reglued later. Using this glue can be a real time-saver when sheeting the first side of a wing or stab. I just hold the sheeting in place, apply Zap to the joints, and the wicking action does the rest. I can't think of any reason to use an accelerator (Zip Kicker) in conjunction with Zap CA. The glue is so fast that speeding up its drying process is a waste of time.

CA will work on materials other than balsa, such as some plastics, metals, and rubber. However, there are other products in the Zap line of adhesives that are specially formulated for some of these materials, and are therefore a better choice.

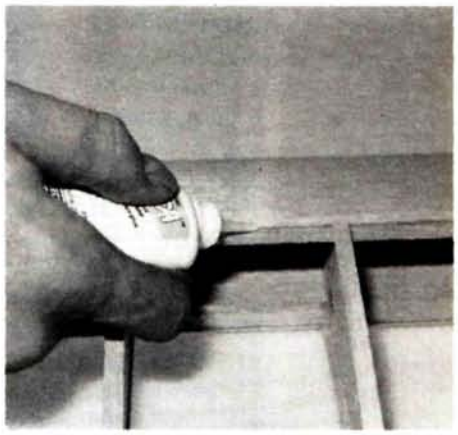
Zap A Gap

Zap A Gap is commonly called CA+ for a very specific reason. The plus indicates that the product is a little thicker and slower drying than regular Zap CA. CA+ comes in a greenish bottle and is really the workhorse of this line. If I could only have *one* of the many Zap formulas, this is the one I'd choose. Zap A Gap can be used on almost any material imaginable. And it works real well on oil-soaked surfaces! This formula dries in 5 to 10 seconds, which allows some time for positioning the parts to be glued. The glue can be applied sparingly to only one of the parts and then placed in position. For good-fitting parts, the glue provides a very strong bond and does not require the use of Kicker. If there are slight gaps or voids, the glue will still dry while filling these gaps, but it *will* take a little longer. In

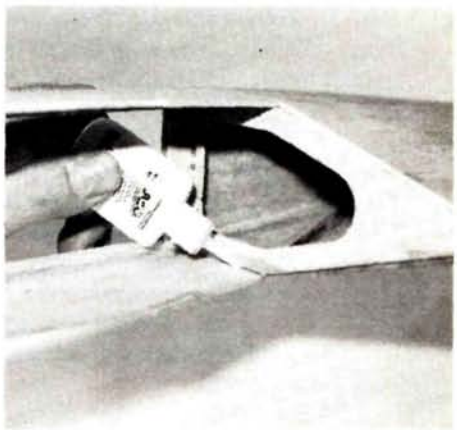
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...and then applying Zip Kicker.



Zap CA (thin) can also be used to ensure the integrity of a joint even after assembly by wicking it into tight cracks.



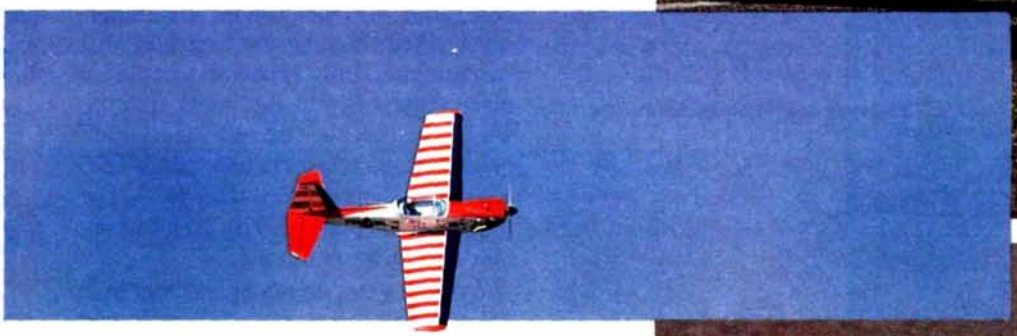
If you find after your model has been built there is a slight space between mating surfaces, Zap A Gap can fill the void.

ROYAL CHIPMUNK 25



I HAD NEVER built an ARF (almost ready to fly) before, so when Lou DeFrancesco asked me if I wanted to try Royal Products'* new PDQ series Chipmunk, I jumped at the chance. One of the great motivating forces of assembling an ARF is quick bench-to-field time with little opportunity for error. The Chipmunk went together in less than five hours, including engine and radio installation, and when I was finished, it looked as though I'd spent much longer on it.

THE KIT. The overall quality of the major parts is good.



And keep in mind, this kit costs less than one half of what other RAFs sell for. My biggest gripe was the cowl, which is very thin. A little fiberglass will help to add some strength, but don't overdo it. You may want some flexibility to help get the cowl over the engine, and you don't want to add too much weight to the nose.

The rest of the kit was a pleasure. There are five major components to the main assemblies, but Royal didn't stop there. The kit contains everything you'll require except engine, radio, prop, and glues (epoxy and cyanoacrylate). You could sit down and start building, then get up and go flying a short time later without having to run to the local hobby shop once. The instruction book is quite clear and replete with good line drawings for each step.

CONSTRUCTION. The two wing halves are epoxied together with the addition of two center ribs. I used 5-minute epoxy, although the booklet suggested the 30-minute kind. A plastic two-piece center section cover is then added with cyanoacrylate, and a single dowel is epoxied into the leading edge. The wing is now finished; the landing gear and servo are added later.

The cowl comes in four pieces. The booklet recommends using tape to hold the parts hold together while you glue them. I used masking tape, but be careful not to let the cyanoacrylate bleed through and bond the tape to the exterior of the cowl. You might also want to wait until the engine is mounted before joining the halves. This will make it easier to locate any openings you'll need in the cowl.

The engine-mounting is quite simple. Two removable plates are attached to the installed motor mount. Fit them to your engine and re-attach them to the mount. I feel compelled to say something about engine selection. The Chipmunk will accept a .25 to .40 two-stroke. Unless you're an expert pilot,

(Continued on page 91)

Type: *Sport*
Channels: *4*
Wingspan: *40 inches*
Wing Area: *425 square inch*
Engine: *.25-.40 two-stroke*
.40 four-stroke
Weight: *4 pounds*



by REED KALISHER



A sporty ARF that almost defies the law of gravity.



IRVINE 21R SPEED

(Continued from page 29)

of the exhaust port was raised to provide, as previously noted, a 192° exhaust period. Standard timings vary according to the use for which the engine is intended, ranging from 150° for the stock R/C aircraft engine, to 175° for the standard speed engine.

A much heftier, machined conrod is used in place of the forged rod fitted to the 20. The crankshaft continues to have a 12 mm diameter main journal, 1/4 in. diameter front journal and 3/16 in. diameter crankpin. On the engine examined, the slightly longer (14.4 mm) valve port was timed to open at 37° after BDC and to close at 60° after TDC.

The factory does not quote power output figures for the 21R. With an engine of this type, a great deal depends on the state of tune adopted for specific applications, i.e., such variables as intake venturi size, compression-ratio, fuel, exhaust system and timing, etc. Our test of the 20-ABC Pylon engine, three years ago, yielded an open-exhaust peak output of just on 0.80 bhp at around 23,300 rpm on a mild (5% nitromethane) fuel. This was very good, especially when one remembers that the 20-ABC Pylon model, in accordance with the European Club-20 pylon-racing rules, was fitted with a restrictive 4.5 mm venturi insert that limited choke area to 15.9 sq mm. The 21R-Speed, in contrast, has a 7.0 mm multi peripheral jet venturi having a choke area of 38.5 sq mm.

Some idea of how much power can be extracted from the 21R is illustrated by the fact that the manufacturer's tests of the actual record engine, with its special tuned pipe, but still running on a relatively moderate 20% nitromethane, indicated a peak output of 1.9 bhp at 36,000 rpm.

Peter Chinn, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

SAITO FA-325R-5

(Continued from page 31)

poppet-valve radial engine design in its use of a geared down cam carrier or drum, concentric with the crankshaft and carrying two cam rings whose lobes lift all the inlet and exhaust cam followers. The Saito, on the other hand, is like all other Saito four-strokes in that it has a separate camshaft for each cylinder. These are, in fact, exactly the same as for the single and twin cylinder models, consisting of an inlet cam, exhaust cam and timing gear, mounted on a fixed pin and spur gear driven from the crankshaft journal. The only difference is that, in order to space the five 48-tooth timing gears around the shaft, there has to be a 24-tooth idler gear between each timing wheel and the shaft pinion. These are all contained within the crankcase nose and there is nothing visible, externally, to reveal the fact that the FA-325R-5 does not have the usual radial engine method of operating its valves.

Also in line with other Saito four-strokes, the FA-325R-5 has one-piece cylinder barrels (i.e., the cylinder-heads are non-detachable) in which are installed chrome-bore brass sleeves. The pistons each have a single ring.

The Saito radial comes with a choice of exhaust pipes. First there is a set of five individual stub pipes for attachment to the cylinders. Second there is a rather nice collector-ring type manifold with two downward pointing outlet pipes that can be installed behind the cylinders.

The manufacturer quotes a practical operating range of 1,700 to 7,500 rpm for the FA-325R-5 and suggested standard prop sizes are 18x10, 20x8 and 20x10.

We shall be reporting in detail, with performance data, on the Saito radial in due course.

Peter Chinn, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

AERONCA CHAMP

(Continued from page 56)

Glancing back over my shoulder at the end of the runway, I turned into it, purposely coming in high so I could slip the Champ down to a touchdown. The Champ is one of the world's most enjoyable airplanes to slip because it is so controllable. You can move left and right, up and down with unbelievable ease and precision, which allows you to pick your spot and work down to it like you were on a wire.

I released the aileron and rudder and just as quickly the airplane straightened out and the sink rate stopped instantly. A foot or so above the grass, I held it off, off, off. I could feel and hear the grass tickling the bottom of the tires as the airplane

(Continued on page 70)

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AERONCA CHAMP

(Continued from page 68)

worked its way gently down to the sod beneath us. It settled easily in a three-point and de-accelerated rapidly in a straight line, with little or no rudder movement from me. I knew from past experience that the same touchdown was available for me on any surface, but on pavement I'd have had to use the slightest amount of rudder to keep it headed straight.

The Champion 7EC/ACs are more than just fine airplanes—they're one of the world's greatest bargains. They've never gained the popularity of the Cub, and the prices reflect that fact. Today you can pick up a decent 65- or 85-horse Champ and pay no more than 60% to 70% the price of a comparable Cub. The bottom price for a flyable Champ is probably in the $5,000 category, although at that level you'd better plan on doing a bunch of tinkering. Think about that when you total up your investment in your last three or four ¼-scale ships. It'll begin to make you start thinking about going to 1/1 scale.

Although the Champ may not be nearly as aesthetically pretty as the J-3 Cub, it can be flown in higher crosswinds and has enough extra cruise speed (85 to 90 mph) that it is an airplane in which short cross-countries are less of a contest between the airplane and your butt.

As a model, in any scale, the Champ in any variation would make a great diversion for a field that is up to its neck in Cubs. The Champ should be at least as forgiving, will build as quickly, and has one other advantage—it doesn't always have to be painted yellow. ■

Q.S.A.A. RALLY

(Continued from page 48)

engines. To round out the numbers, the 747 will use 14 servos and 18 wheels! The disconnect between the two models will be operated by either pilot and the two models have separate systems to disconnect them. Both these enterprising builders have agreed to keep us apprised of the project.

By far the largest group attending were the San Gabriel Valley R/C League. Would you believe this group brought 32 members with them? Their sunshade alone would have covered some of the smaller towns in Nevada! One of the

(Continued on page 72)

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Q.S.A.A. RALLY

(Continued from page 70)

models they brought along was a Kinner Sportwing. That's not unusual, but the model was built as a club project and involved a considerable number of people under the leadership and guidance of John Krohn. The model is powered with a 3.25 c.i. Saito 5-cylinder radial. It looks great.

One of the highlights of any QSAA rally is the Saturday night banquet and awards presentation. This year's award for Junior Achievement was won by a young lady named Heather Wright. Heather is the granddaughter of Shorty Wright, a founder of QSAA and a superb model-builder up until his passing a few years ago. Shorty would have been proud of Heather and it was a delight to see her following in Grandfather's footsteps.

The awards presented are the result not so much of judging, as might be done at a contest, but of voting by those participating in the event. To be "elected" by one's own peers is high praise indeed. QSAA also monitors the awards so that there is no danger of any one modeler taking all the marbles. *One entry, one trophy* is the usual rule. There is a perpetual and a "keeper" in each case. Here is a brief listing of the winners.

Longest distance traveled to attend: Mel Barber, South Africa. Marathon of Flight: Ron Tie, Tri-Pacer, 272 miles. Multi-engine: R. McClung, Downey CA, *P-38.* Best Biplane: Rich Irwin, CA, *Stearman.* Best WW I: Jim Dokos, *Sopwith Pup.* Best finish: Robert Anderson, Ventura, CA, *Laser 200.* Best Scale: Bob Francis, Aptos, CA, *Ju87 Stuka.* Best Military: Joe Zimmerman, Buena Park, CA, *P-39.* Mechanical Achievement: Forest Edwards, Grass Valley, CA, *5-cylinder radial.* Powder Puff: Connie Vaughn, *Pitts S2-A.* Junior Achievement: Heather Wright, *Fly-Baby Bipe.* Standoff Scale: John Krohn, *Kinner Sportwing.* Best Scratch-built: Jim Johnson, 1/3-scale *WACO biplane.* Best of Static: Dick Enos, *Se-5.* Best Civilian Aircraft: Claude McClulloch, Montezuma, IA, *WACO N.* Best Electric: Tony Naccarato, *J-3 Cub.* Best Ultra-light: Addy Naccarato, *Ritz Model A.* Best of Show: Jorg Vogelsang, W. Germany, *Me 163 Komet.* ■

FOUR-CYCLE

(Continued from page 60)

way, I have not seen this strange mess in any of the engines run with castor. Whatever the cause, I repeat: do not use automotive oil in the crankcase of your FK-50.

Correction

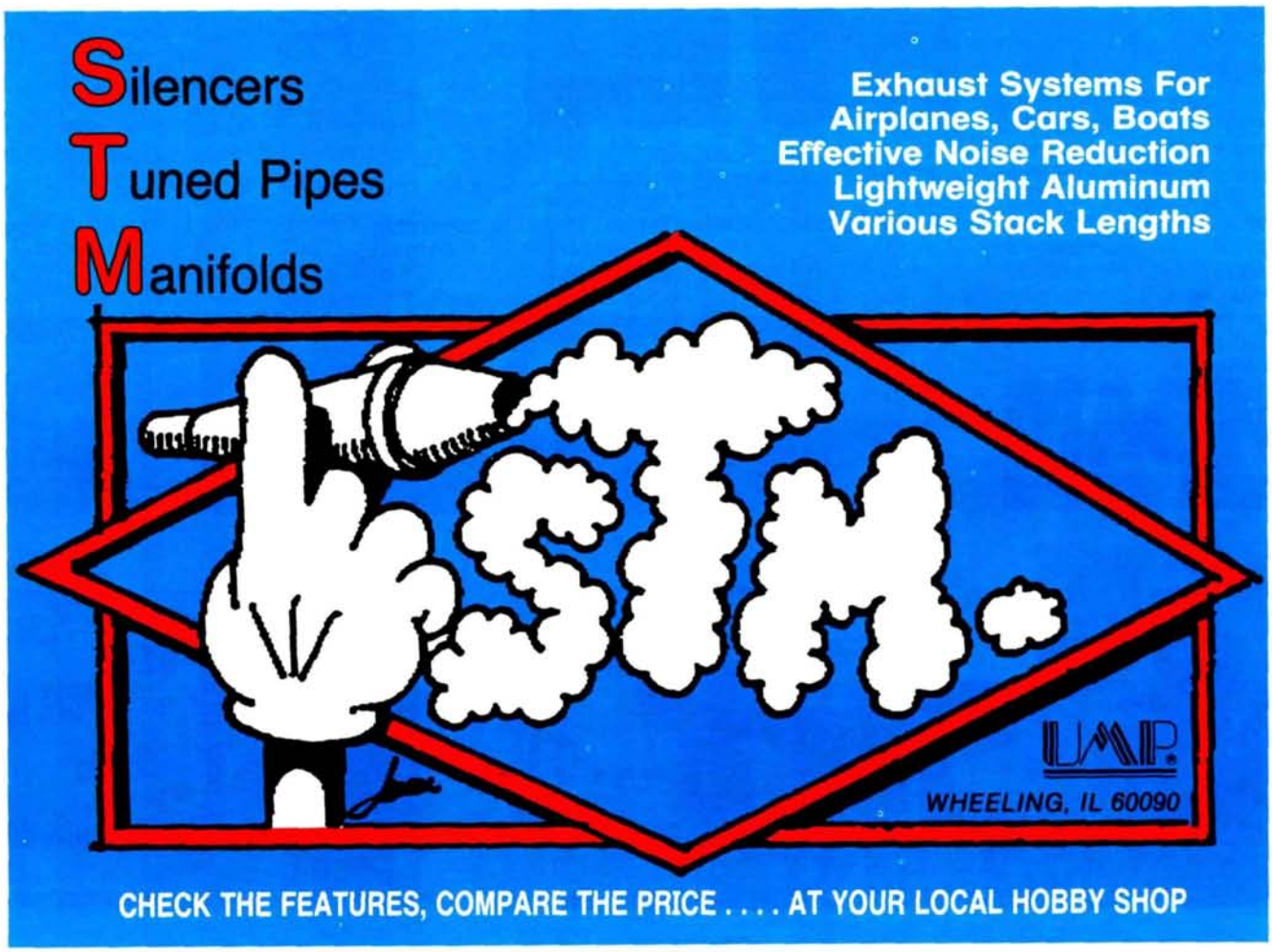
Since I've just been vindicated of my J-3 goof, I guess it's fair that I correct another error. Also in our August issue, I reported that the Tele-Tachometer airborne rpm and airspeed system is available from AYK Racing USA. This is incorrect. The actual importer is Condor Hobbies, recently established in a new location, and with a new name—Condor R/C Specialties*.

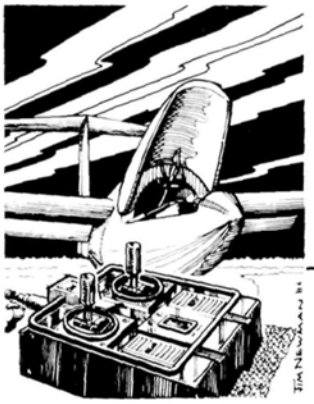
Well, it's happend again—I'm out of space. But I'll certainly have more room for *your* letter next month.

Eloy Marez, c/o *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the company mentioned in this article:*

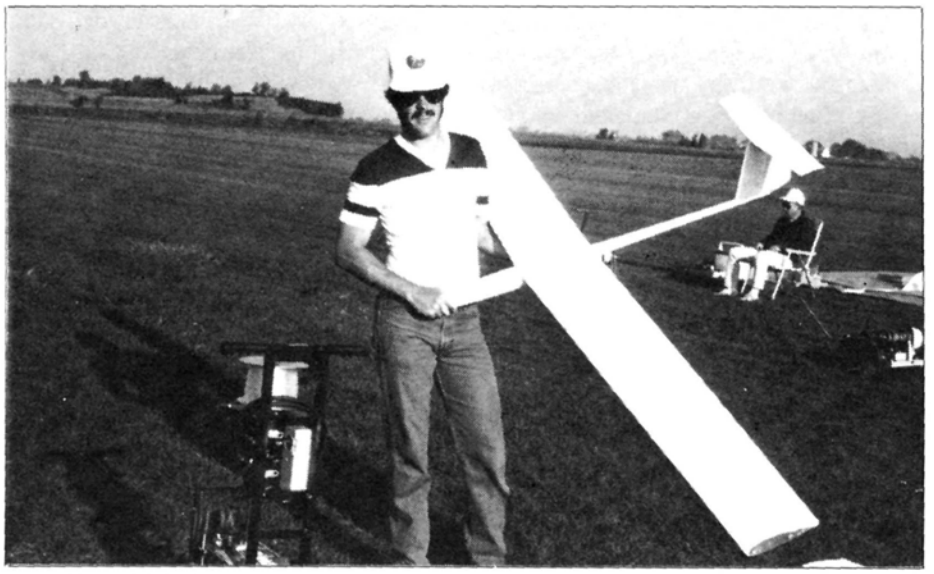
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Soaring News

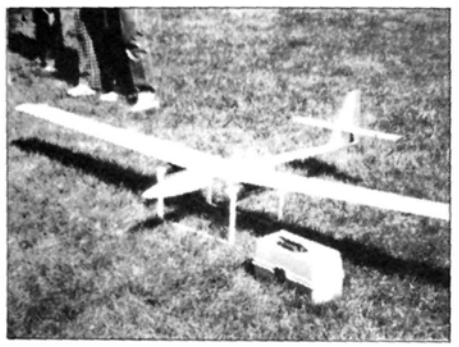
by JIM GRAY



Lenny Keer with his Virga, a John Wyss design.



Don Edberg assembles his sailplane.



Using p.v.c. pipe for a cradle is a neat way to keep your airplane off the ground.

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BUTEOS

Broad wings and broad rounded tails; often seen soaring in wide circles high in the air.



FALCONS

Streamlined, long pointed wings; longish compressed tapered tails; strong rowing wing beats; lose some of their pointed wing and tapered tail look when not in direct flight.



ACCIPITERS

Short, wide, rounded wings; long tails: flap, flap, flap-sail flight.

illustrations by PAUL CARRIER

THE FAI F3B team selection finals were held in Minneapolis, Minnesota, over Labor Day weekend with 17 pilots competing from Illinois, New Mexico, and California. Bob Sealy, president of the MRCSS (Minnesota R/C Soaring Society) was the contest director, and the MRCSS provided the manpower to run the contest. Five crew members were permitted on the field during a task. The start of every task required the crews for each flight group to set up their two winches as fast as possible, which means the winch, battery, line, and turnaround; and the end of every task for each flight group meant that this equipment had to be taken in again. For example, many of the crew walked the distance from winch to turnaround about 60 times!

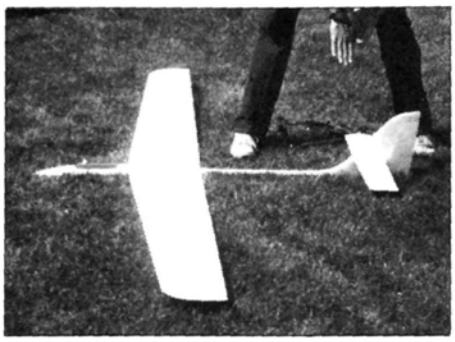
Fortunately, there were very few incidences and accidents to mar the competition, although some of the winch lines continually broke, causing minor damage in at least one instance to the stab of Rick Spicer's Synergy II. One speed task was completed in near darkness, and the speed runs themselves made pilot skills very apparent. Larry Jolly (4th place finish) landed on the finish line after his speed run—a situation which was protested, and later decided by a jury. And Larry won the judgement. Crews packed the planes, winches and all support equipment each night in the dark and then walked the 200 yards to their cars to load the gear aboard, which means that the support crews were absolutely indispensable and can be considered the *sine qua non* of the contest. There was no night life. Pilots slept while crews repaired equipment and readied it for the next day's flying. Many Becker (German) radios were evident, and sailplanes featured camber-changing devices (flaps) in their wings.

Hawks

Soaring birds are exemplified by the hawk family, which has three main read-



Steve Lewis adds ballast to Synergy II before distance event. Ballast is lead shot.



Ray Vann with his original design Eagle. Racelite Composites by Western Fiberglass, Petaluma, California.

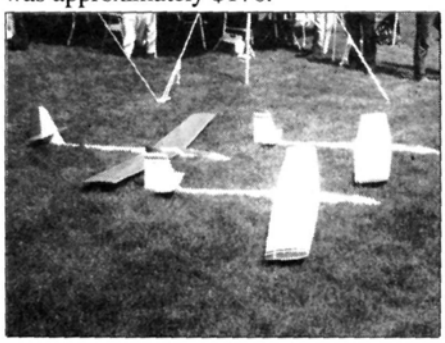
ily distinguishable silhouettes. You have probably enjoyed the thrill of flying in company with one or more hawks at some time in your soaring career, and you may have wondered exactly what kind of hawk it was. Although at height it may have been impossible to tell the exact sub-specie (red tail, red shoulder, etc.), you probably could have identified the family branch. Just so you'll be better equipped next time, we present here—courtesy of the Greater Detroit Soaring and Hiking Society newsletter—a silhouette of these three family branches. The original was prepared by Paul Carrier, graphics designer and illustrator, through the auspices of the Connecticut Audubon Council, as an aid to the New England Hawk Watch Study, Hartford Audubon Society, the Massachusetts Audubon Society, and many Audubon clubs in New England and New York.

Whether you call them hawks, raptors, or birds of prey, this wonderful family of soaring birds can provide many hours of fun and education just by observing. We, as glider pilots, are uniquely equipped to study them close-up, so to speak, by attracting them to our own machines as we soar. Those of you who have flown in the company of hawks will notice the soaring etiquette they observe: circling in the same direction on opposite sides of the circle so as not to interfere with each other, and for maximum visibility. When one joins you in formation, you'll see this for yourself. When you join one of them, they expect a similar observance.

Just a few weeks ago, I had the great pleasure of soaring in formation with a young herring gull; not a hawk, but great fun nevertheless. I would guess that the gull thought my Prophet sailplane, covered in charcoal and white, was a bigger and therefore *smarter* gull. Anyway, we flew together in close formation through a series of slope turns, dives, pull-ups, and other mild maneuvers made close to the cliffs and far out over the water. The gull was able to match exactly my speed and sink rate, staying at all times within about 6 feet from my sailplane, slightly above and behind to the left. The close-in passes were a joy to behold, as you could see the ripple of each feather and change of wing and tail angle. In fact, I think I saw a slight *smile* on his beak when he tired of the game and left me in a demonstration of soaring skill that I just couldn't match. Maybe he enjoyed the flying (I didn't notice any other gulls flying in this kind of formation) or maybe he thought that I (being bigger and presumably smarter) would lead him to food. In any case, for me it was a gratifying educational experience.

Sources of Spruce

Those of us who fly quarter-scale or larger sailplanes find a need for spruce as a replacement for balsa in wing spars, fuselage components, and other parts of our sailplanes. Recently, a good friend from Metairie, Louisiana—"Oz" O'Brien—wrote to me about a source of excellent spruce. It is Sitka spruce, aircraft grade, available in various diameters and lengths, from Posey Manufacturing Company*. Oz says, "I was pleased and surprised to learn that we could purchase Sitka spruce in thicknesses of ¼ inch and up, and in lengths of 60 inches and over. The bottom line is this: we were able to buy 60 pieces in thicknesses of ¼ inch, ⅜ inch, and ½ inch, all 60 inches long and 6 inches wide. The total cost, including freight from Washington to New Orleans was approximately $170.



The winners of FAI F3B Team selection finals were two Synergy IIs in foreground, King at their rear.

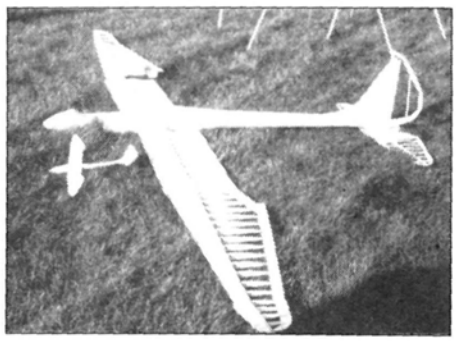
"We divided the batch into three portions and cut strips of various widths on a table saw using a 100-tooth, carbide tipped, 10-inch blade. I was amazed at the quality and smoothness of the resulting strips we obtained. The quality of the wood is excellent. I've never seen such tight-grained wood anywhere. And the price is unbeatable, even if you take into account the time spent cutting all of those strips. I've built three quarter-scale birds and an 84-inch Quaker, and I still have enough left to last me a long time. I wouldn't hesitate to recommend Posey Manufacturing Company to any of your readers, who know, I'm sure, that Sitka spruce is only slightly heavier than balsa, but much, much stronger."

Oz, we thank you for the information, but would like to add that spruce is approximately 3 times heavier than balsa (depending on the weight of balsa you use) and the price you quoted is no doubt subject to some variation because of shipping costs and possible price increases since you purchased yours. Readers will also be interested to know that Aircraft Spruce and Specialty Company (1-800-824-1930 or 1-800-233-9686) sells aircraft-quality spruce and will provide small quantities suitable for model builders. They're very nice folks to deal with, and also have a supply of Safe-T-Poxy (sample kit of 1½ quarts, including hardener) for $16.30 plus UPS shipping charge. You probably recall that Safe-T-Poxy was developed for those people who are allergic to epoxy (particularly the hardener) and may be used in some cases with none, or few, of the ill effects suffered by those like myself who are allergic. It is not possible to say who will or won't be affected, but here's an opportunity—at a very good price—to find out.

Wing Coverings

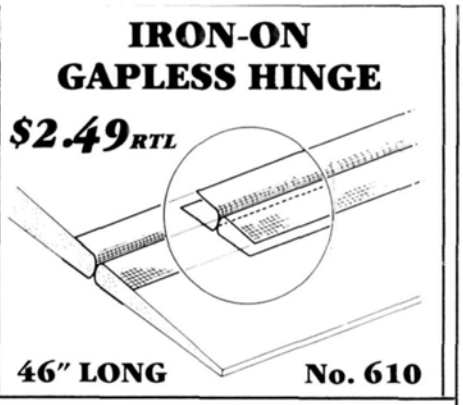
A few months ago, Harry Finch from Cypress, California, wrote to tell me

(Continued on page 100)



John Borlaug's huge Bird of Time. Note size compared to smaller prototype.





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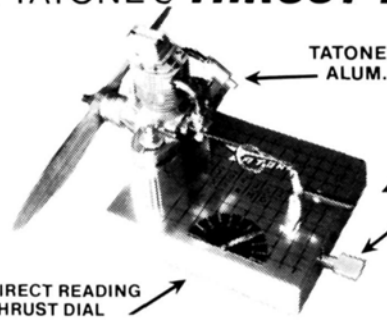
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TWILIGHTER

(Continued from page 25)

carries the horn should be firm stock. Sand the notch in the rudder with a piece of sandpaper wrapped around a length of wire.

The fuselage consists of two formers and a firewall, two sides cut from 1/16-inch sheet, some 1/64-inch plywood for the doubler at the firewall and some leftover sticks from stab construction. The formers are cut from balsa ply which is made by laminating two pieces of 1/16-inch balsa with the grain running in different directions. The firewall is 3/16-inch plywood.

Glue the 1/16 inch-balsa doublers in the areas shown and epoxy the 1/64-inch ply at the nose. Glue the 1/8-inch square uprights and the stab reinforcement to the sides. Pin both sides together with doublers on the outside and sand them to the same outline with a sanding block. While they are joined, drill the 3/16-inch holes for the hardwood dowels. Cut the slots in the aft end to clear the pushrod ends and the sides are ready to become a fuselage.

Glue the formers to one of the sides in the location shown, use a right triangle to make sure they are exactly vertical to the side. Glue the other side to the formers directly over the first. Check alignment. When the glue has set, epoxy the firewall in place and pull the tail together and glue. Sheet the top and bottom of the fuselage with 1/16-inch balsa with the grain running across the fuselage. Sand the completed fuselage. The dowels are glued in position after the fuselage is covered.

The airplane is covered with Top Flite's* MonoKote and the surfaces are hinged with the same material; follow the directions packed with the film. The trim is simply strips of different colored film ironed in place. Trim the covering away from the area of the stab where it is glued to the fuselage and from the top where the fin is glued to the stab.

The pushrods are made from 1/4-inch-square balsa with threaded rod, bent as shown, glued and bound to it with thread. Elevator and rudder horns are small Goldberg units. The servos are mounted on a plywood tray which is glued to the supports on the fuselage sides. The battery is forward of the front bulkhead and the receiver is just ahead of the servos. Give the firewall a coat of epoxy and when it has cured, mount the engine with 3/8-inch wood screws right into the firewall. Adjust the pushrods until the elevators and rudder are at neutral and balance the airplane at the location shown on the plans.

FLYING. This is an airplane that can be given a glide test, a rarity in today's

(Continued on page 80)

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TWILIGHTER

(Continued from page 79)

world! Remove the prop and aim the airplane at a spot on the ground about 50 feet away and give it a push about as hard as you would throw a baseball that you wanted to loft into the spot. If the airplane wants to turn in one direction or the other, correct the tendency by adjusting the clevis on the rudder. If balance is correct and the rudder trim is right, a long straight glide should result. Balance can be achieved by moving the battery pack fore or aft as needed.

Under power and with the radio turned on, launch the airplane in the same way as the glide, but hold a little back stick for a gentle climb. Wait until a little altitude is gained before trying turns. Depending on the power of the engine, the climb can be anything from gradual to frisky. Suit yourself. With the engine using high nitro fuel and a small prop, loops and snaps are possible, but I enjoy the big prop and low nitro for the relaxing fun of just cruising.

Randy Randolph, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the manufacturer mentioned in this article:*
Top Flite Models, Inc., 2635 Wabash Ave., Chicago, IL 60616. ■

GOLDEN AGE

(Continued from page 42)

of large models it would make an excellent choice as a docile OT R/C. We should describe it for you.

In the late '40s, the Capital Model Co. of Long Island offered a kit for an FF style 9-foot-span Piper Cub Cruiser that would qualify as giant scale even today! Following the trend of the times it was a stick-and-tissue sort of thing, admired by many for its size alone, but certainly not something for R/C—unless you were Alex Schneider.

Alex knew that he needed a large, powerful model to carry the battery weight he projected as necessary for reliability with his reed system. Of the few really large FF kits available, the Cub's scale lines caught his eye and he began to develop an R/C version from the basic design. Obviously, after the many required changes, it was practically a new model,

(Continued on page 82)

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GOLDEN AGE

(Continued from page 80)

the Schneider Cub.

Naturally, the first step was to increase the structural material sizes for the heavier weight. The story goes that when the first version was flown with the high-aspect-ratio Piper wing, it was short on stability. That was easily solved by shortening the span to 7 feet, 4 inches. After that, Alex stuck pretty close to the scale shapes and outlines throughout the development.

At the time, the Anderson Spitfire .61 ignition engine was a very reliable powerplant. It also was available with a two-speed ignition, at a time when glow engine throttles were still troublesome. So, Alex chose the most reliable way with the Spitfire. He also built his own copies of the Rockwood reed system, both 3- and 5-channel versions. When the original ground-based Rockwood transmitter showed some shortcomings, Alex designed his own circuit and installed it in a hand-held transmitter. In typical modeler fashion, this first reed transmitter was in a wooden box!

Along with all the other niceties, we take simultaneous control capability for granted. It was a *dream* with early reeds. The reed systems were soon labeled "Bang-Bang"—you could have one control at a time and full deflection, that was it. Mechanically, the control boxes were even fixed to prevent more than one; hitting two could make the reeds go crazy. Have we said all these first systems were *single stick?* The stick was for rudder and elevator, and a push button controlled the engine.

Alex Schneider became quite proficient and dreamed of more, inverted flight, for instance, and he found that the big Cub required generous amounts of down elevator to stay inverted. Without simultaneous control, if you held the needed down, you couldn't steer. His solution was clever; he added a *mercury switch* to the elevator servo circuit, so when inverted, the sevo was "locked" in down, enabling the steering channels to be used. Through this technical achievement he did get to inverted flight, but with hindsight we can imagine some recovery situations where getting that down out in time probably created a sweaty brow.

We'd like to think that Alex's Cub of the '80s might be a good example of that OT R/C that some of us desire. Alex's current project is a ¼-scale Piper PA-18 Super Cub which will be active at the local club's mountain-surrounded field. The Cub also water flys from Clearlake,

(Continued on page 84)

GOLDEN AGE

(Continued from page 82)

so floats are on order for the PA-18 as well. Looks like Alex Schneider is enjoying modeling, once more, in retirement.

We'd like to thank the many who have taken the time to write and say how much they enjoy the "Golden Age of R/C." Knowing that the effort is appreciated makes the work a pleasure. It's surprising to know how many oldsters, among others, are out there actually enjoying OT R/C. Without a formal movement (such as S.A.M.) in effect, the activity is outstanding and speaks for itself. Along the way we have asked for input from all of you, who can add so much to these writings as in the following example.

Robert Williams of Vulcan, Michigan, writes, "I am thoroughly enjoying the "Golden Age of R/C" and would like to help with needed photos of the early-day Esquire. Enclosed is a photo of both my Esquire and Tri-Squire.

Bob tells us that he has had these OTers from the early days and still flies and enjoys them regularly! The original radios are no longer used, the models having been converted to rudder and engine control using modern three-channel radios for guidance.

The Esquire is powered by an Ohlsson .23 which hauls it with authority. In the Tri-Squire he uses a McCoy .19 Red Head which does the job well. We assume that the Mac must be one of the latter-day sport models. We can never forget the .19 Red Heads we used in C/L speed. It would be hard to conceive of how those record-shattering powerhouses could adapt to R/C.

For the modern R/Cer's info, there were three of those initial R/C kits, the Live Wire Trainer, the Guillow Beam and the Midwest Esquire. All were similar in size and differed mostly in appearance. At any one flying session you often saw all three in use.

The Esquire was designed by Don Parsons and produced by Midwest Products of Hobart, Indiana. It was probably kitted a year or so after the L.W. Trainer was marketed. With a 500-square-inch wing, the design weight was three pounds. The recommended engine was .15 to .19, which would've been considered excessive power in those days, but the Esquire apparently handled it well.

In layout, and aerodynamically, the Esquire was very similar to the L.W. Trainer; considerable attention was paid to getting maximum possible lift and a similar force arrangement controlled the pitching axis. The structure was also similar, using the now-standard sheet wood instead of sticks that were used at that time.

Like the Live Wire series, the Esquire went through several versions over a period of years. One of the most popular was the Tri-Squire, which added a nose wheel for better ground control. What may not be well known is that in recent times Midwest Products produced a giant version of this OT design, and kits for this one might still be available.

In any event, Bob Williams is exemplar of the many enjoying OT R/C. His Esquire and, later, Tri-Squire are typical of the early kit jobs which brought many into R/C.

James Williams of Trotwood, Ohio, also checked in with memories of his original Esquire. Jim used a Cameron .15, Kraft S.C. receiver and a Babcock Compound Escapement in his version. The transmitter was Controlaire. Jim wishes he could say that his first R/C experience was successful, but like many, it was not.

(Continued on page 91)

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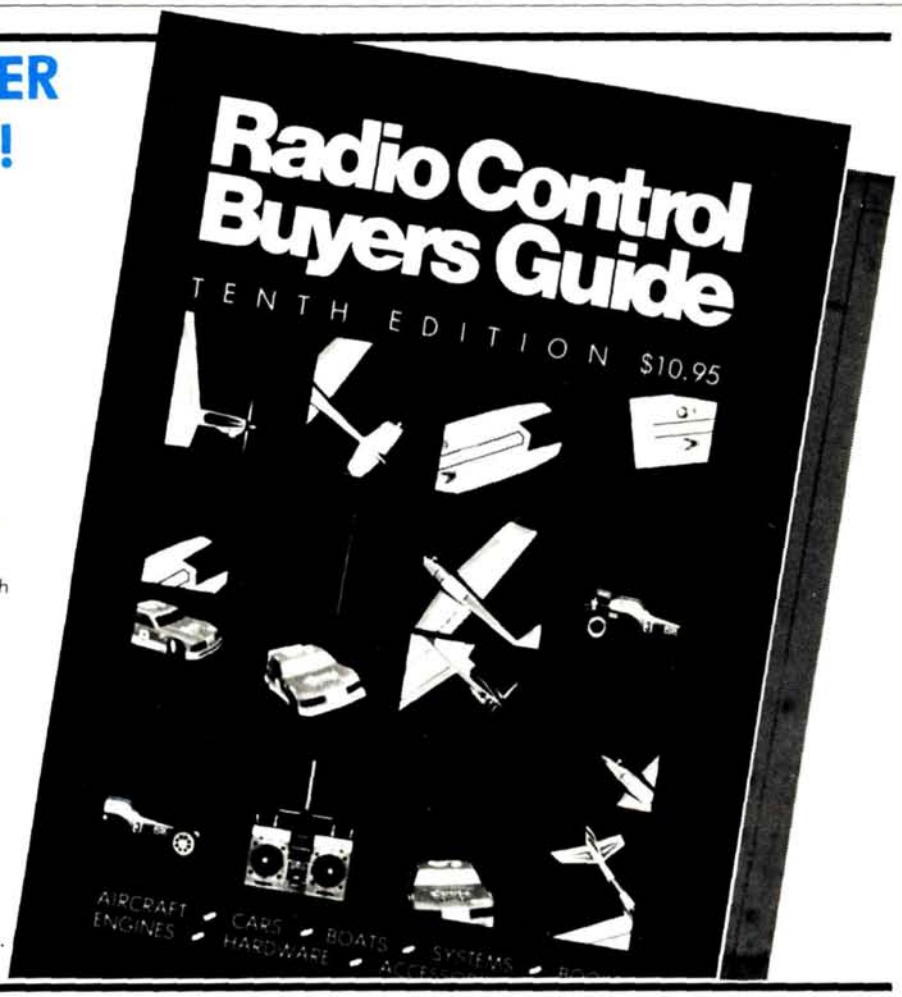
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GOLDEN AGE

(Continued from page 84)

Apparently all he saw on the first launch was a beautiful tail dance and then the resulting crash. He still has the original plans and hopes to soon build another Esquire knowing that he should have a great-flying OTer the second time around!

Jim went on and had early successes with other designs such as the Falcons, Freedom 7, and Skylane 42 plus others too numerous to mention.

Unearthing Milestones

We've planned future discussions of several happenings in R/C which were exceptional, and *you* might be able to add something to these. One will be early World R/C record attempts; we know that a lot happened at Dalgren, Virginia, for example. And how about the Detroit Invitational meets. These would be outstanding, even today. Most important to the modern day fun flyers would be the Selinsgrove Meetings, where so many of the early people gathered each year. Perhaps you know of others.

The point is, if you have any input, even if it's just photos of these early doings, you could be of great help. Just look at what Jack Albrecht and Alex Schneider were able to add to recent efforts. You, too, could help in a similar way. After all, we have no history books to refer to, we've got to unearth the milestones.

Hal "Pappy" deBolt c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

ROYAL CHIPMUNK

(Continued from page 65)

don't use a .40. I recommend using a .25 or .30.

I have always liked a little reserve power, so I selected an Enya .40 XTV from Altech Marketing*. My first inkling to "more than you need, Reed" should have been when I couldn't fit the cowl over the muffler! Instead of massacring the cowl, I installed a J'TEC* side-mount muffler. Next, I drilled and tapped a hole for a fitting to pressurize the fuel tank. This solved the no-fit dilemma.

The biggest deviation from the plans should come next. *Don't* attach the tail section yet. Not too long ago, Art Schroeder reviewed another Royal ARF (the Telstar, January '86 *Model Airplane News*). He pointed out that the elevator control was accomplished by a two-pronged yoke pushrod. This was installed

(Continued on page 96)

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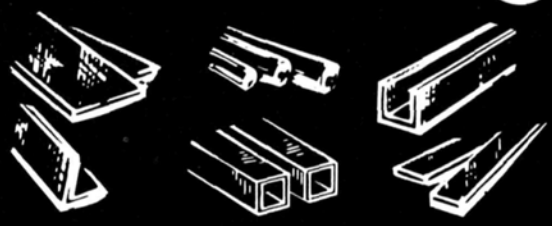
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230	.016 x 1/4	.20
231	.016 x 1/2	.30
232	.016 x 1	.50
233	.016 x 3/4	.40
234	.016 x 2	.90
235	.025 x 1/4	.25
236	.025 x 1/2	.40
237	.025 x 1	.70
238	.025 x 3/4	.55
239	.025 x 2	1.30
240	.032 x 1/4	.30
241	.032 x 1/2	.50
242	.032 x 1	.85
243	.032 x 3/4	.65
244	.032 x 2	1.60
245	.064 x 1/4	.60
246	.064 x 1/2	1.00
247	.064 x 3/4	1.25
248	.064 x 1	1.70
249	.064 x 2	3.00
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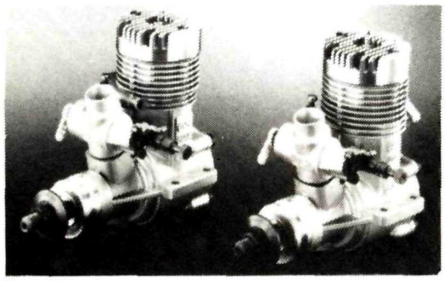
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Product News



ROYAL CESSNA .40 ARF

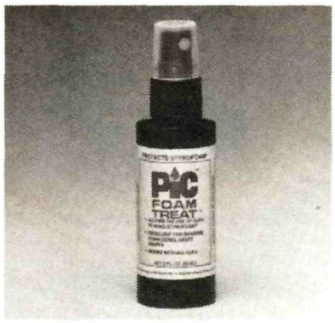
This semi-scale, buy-today/fly-tomorow kit from Royal Products Corp. (790 W. Tennessee Ave., Denver, CO 80223) is a buy-today/fly-tommorrow trainer that features lightweight foam/plywood construction with prepainted high-gloss, fuel-proof finish. All necessary hardware including wheels, tank, motor mount, plus an illustrated step-by-step instruction manual is included. Specs: wingspan 61.5 inches, length 46.5 inches, wing area 615 square inches, engine size .40-.45 two-cycle or .60 four-cycle.



O.S. .61 LONG STROKE

The Long Stroke aircraft and helicopter engines feature a smaller bore and a longer stroke than the current .61 FSR series. The longer stroke creates greater force at lower rpm than the .61 FSR. This is especially true of output in a range of up to 12,000 rpm. However, due to improvements in other parts, such as the new carb, the Long Strokes develop higher output throughout the entire range, up to 17,000 rpm. The side-exhaust Long Strokes are designated SF and the rear-exhaust versions are designated RF. A total of seven Long Stroke airplane and helicopter engines are available, three for airplane and four for helicopter. Both the airplane and helicopter engines feature newly designed carburetors for maximum efficiency and ease of operation. The Long Strokes are available in both ringed-piston and ABC versions.

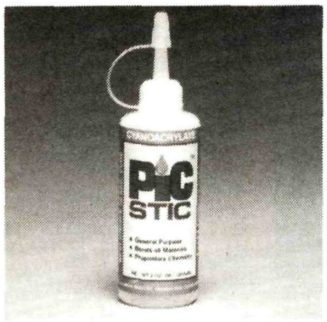
O.S. Long Strokes are distributed by Great Planes Model Distributors (P.O. Box 4021, Champaign, IL 61820).



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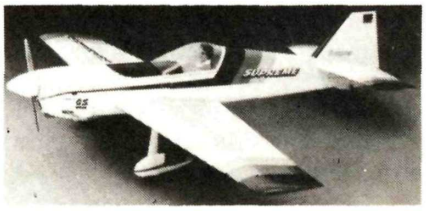
For more info on PIC products contact Penn International Chemicals (943 Stierlin Rd., Mt. View, CA 94043).



PIC STICK "BEST CHOICE" CyA+

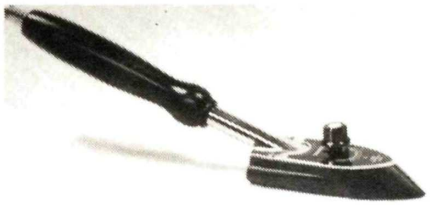
For general-purpose overall construction and fabrication—"Best Choice" has an overall cure rate of 30 seconds—also for gap-filling and fillet-forming. Bonds to oily surfaces. "Best Choice" has lower odor and won't brown with age. Sold in high-density, transluscent bottles so level can be monitored.

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HOBBY LOBBY SUPREME

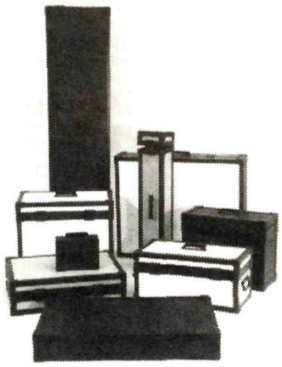
Supreme is a pre-built balsa/plywood foam-winged sport plane with a 65-inch wingspan, 53-inch length and 688-square-foot wing area. It was designed by Graupner to show off the capabilities of large four-stroke engines in an airplane designed to make use of the high torque of four-strokes. With its semisymmetrical 12% airfoil, large wing area, and light weight, Supreme climbs vertically, and executes giant constant-speed maneuvers. All you must do is assemble the wing halves, attach control surfaces, cover it, and install R/C gear. With Supreme comes Graupner's No. 594 R/C hardware kit, which includes wheel, hinges, connectors, etc. Contact Hobby Lobby International (5614 Franklin Pike Circle, Brentwood, TN 37027).



COVERITE HEAT SEAL IRON

The Coverite Iron has "roll bars" on the sides so you can actually roll the iron into fillets and under cambered areas. For normal sheeted surfaces and open structures, the sole of the iron is perfectly flat with bevelled edges, so you can be sure you're getting the proper heat penetration, without marking the surface. The toe is slightly rounded so you can get into corners without digging in. Testing shows that irons with turned up toes create problems because the modeler loses his feel for the contact between the iron and the covering. Hi-tech thermostat reduces temperature drift to only 5 degrees. Ordinary irons can vary as much as 40 degrees, often the cause of those mysterious bubbles. Includes a disappearing stand and a wire stand. Contact Coverite (420 Babylon Rd., Horsham, PA 19044).

Descriptions of new products appearing in these pages were derived from press releases supplied by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News,** or guarantee of performance or safety by **M.A.N.** When writing to the manufacturer about any product described here, be sure to mention you read about it in **Model Airplane News.**



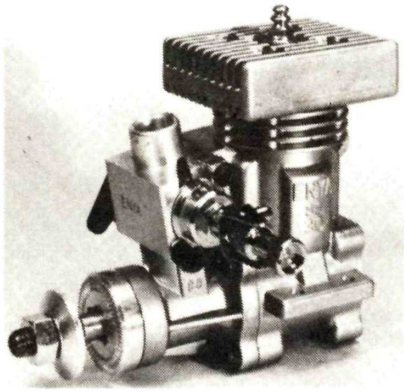
SPACECASE KITS

Matrix Enterprises Inc. (7015 Carroll Rd., Dept. 01, San Diego, CA 92121) recently introduced an exciting new concept in enclosures: the SpaceCase. This inexpensive kit comes with simple step-by-step bonding instructions to produce a sturdy box from pre-cut pieces. Available in any size from 90 cubic inches to 10 cubic feet. Because the SpaceCase is constructed of tough ⅛-inch ABS plastic, there's nothing to corrode. No tools or cutting are required to put the kit together. Extra protection is provided, when necessary, by adding foam and/or plywood liners. And there are special, heavy-duty handles and locking latches to make the case fit virtually every special need.



ELECTRIC PRONTO

This version of the Tidewater Pronto was designed specifically for and flight-tested with the Olympus belt-drive electric power unit, No. HLH705. With this inexpensive electric power unit, an 8.4-volt Ni-Cd, No. HLGR3418, an 11-6 Graupner or Grish prop, and an electric speed control, the Electric Pronto will start from the transmitter (Try that with a glow engine), taxi, take-off, do touch-and-goes, aerobatics, land, and taxi back to the hangar. (Wingspan 60 inches, area 480 square inches.) For more info contact Hobby Lobby International (5614 Franklin Pike Circle, Brentwood, TN 37027).



SS30 HELI GM

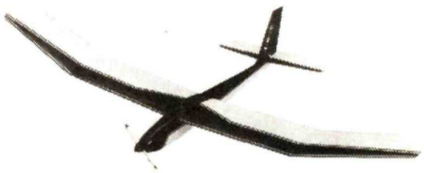
The SS30 Heli with standard carburetor features a heat-sink head for heat dissipation, Schneurle porting, a steel cylinder liner and an alumninum alloy ringed piston for easy starting and super power, a steel crankshaft supported by two ball bearings and a ¼-28 threaded output shaft for easier installation in some of the most popular helicopter mechanics. The G5.5 mm carburetor is easy to adjust for top end and for idle. The affordable SS30 delivers 0.55 to 0.65 horsepower with muffler. For more info see your favorite hobby dealer or contact Altech Marketing (P.O. Box 286, Fords, NJ 08863).



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The Conquest system is manufactured by Futaba Corp. of America (555 W. Victoria St., Compton, CA 90220).



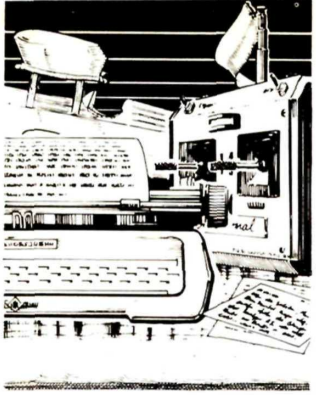
GOLDBERG ELECTRA

The Electra is an electric-powered aircraft specially designed for the beginner as well as the seasoned veteran. The aerodynamics of the Electra come from the Gentle Lady. With a span of 78.25 inches, total wing area of 663 square inches, and a weight of 48 ounces R-T-F, the Electra insures flyability. It's available in two versions: Standard kit with all wood parts, full-size plans, fully illustrated instruction booklet and a full hardware package; the Deluxe kit with all the standard items *plus* Turbo 550 (tm) motor, switch harness, prop, spinner, and prop adapter. Electra is powered by a 6-cell, 7.2 volt battery pack like the ones used in R/C cars (flat or humpback). Designed for two-channel operation but an optional third channel can be installed for On/Off motor control. Contact Carl Goldberg Inc. (4734 W. Chicago Ave., Chicago, IL 60651) for more information.



HOBBICO HEAT GUN

The Hobbico Heat Gun is perfectly suited for any brand of heat-shrinkable fabric or film used for covering model airplane framework. Its features include 1,000 watts of power for plenty of heating capacity, adjustable air intake baffle for temperature control, removable nozzle to concentrate heat where needed; quiet, low-noise design, built-in neon pilot lamp, three-position rotary switch controls (hot, cool, off), and lightweight, 14-ounce design. Ideal for any brand heat-shrink tubing and for drying glues. The Hobbico Heat Gun is distributed by Great Planes Model Distributors (P.O. Box 4021, Champaign, IL 61820).



Radio-Control

by ART SCHROEDER

POGO SAID it, "We have met the enemy and they are us!" A recent visit to a new local flying site showed how much the above is true. This site, a pick-up place and with tenuous usage at best, could serve local modelers for a few years until commercial or residential building takes place. But it won't! At least not if flying practices I saw continue. The field will become just another in a long line of places from which R/Cers have been dismissed.

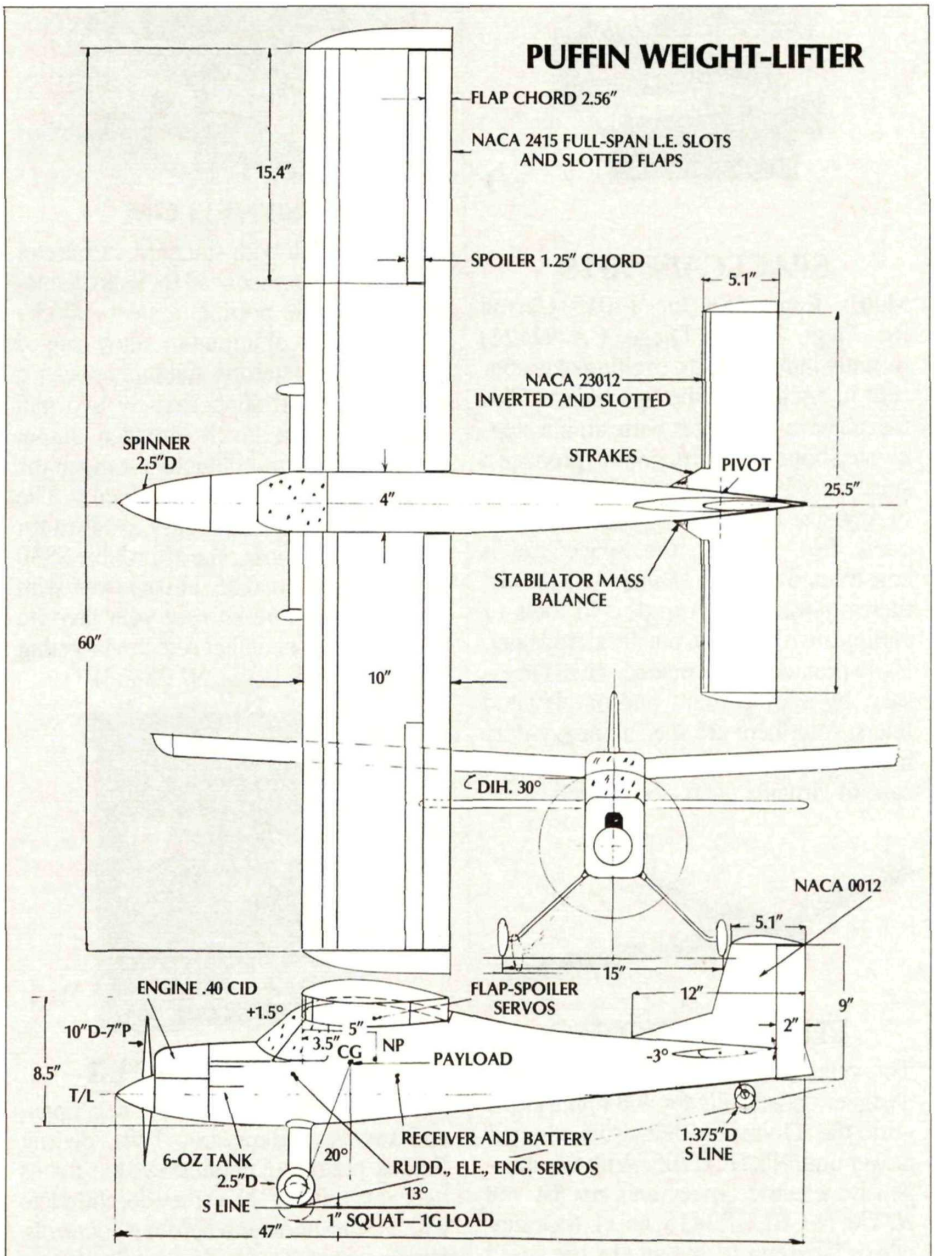
The field is an abandoned, fixed-base airport with a nifty, paved runway just begging to feel the touch of DuBro wheels. There is a housing development to the left (by a fair distance) and a wooded area to the right of the runway. Simply stated, flying with well-muffled engines over the wooded area would only raise the ire of a few rabbits and an occasional water snake. Flying over the wooded area would insure use of this area for many, many months.

So what do I see? In a dozen takeoffs, at least half involved left turns after lift-off; just enough to put each airplane over the housing development. A right turn would have been most sensible—but when has it been said that R/Cers are sensible. Add to that some of the most inefficient mufflers I've heard in a long time and all the ingredients for an early dismissal are at hand. It's a pity and, unfortunately, a story repeated over and over.

In recent years a new word has entered the jargon of those involved with radio control. The word "footprint" is very important. It speaks of the area size our noisy engines cover. It is, in short, the reason FAI has gone to the Turnaround pattern.

The closer model airplanes are flown to their takeoff site, the less their inherent noise will bother non modelers. The FAI recognized the need to keep the track of our flying objects to a minimum and it's time that active fliers did the same.

I have three suggestions to make Pogo wrong:



An Andy Lennon design that fits the payload event suggested by Schroeder. These are only hypothetical figures awaiting definition by those interested or involved.

1. Use the best muffler you can find and pray our manufacturers will find a better way.

2. Keep all flying as close as possible and avoid (like the plague) any over-flying or near-flying of residential areas.

3. And, use the highest-pitch propeller commensurate with your flying needs. Such will keep rpm and noise down somewhat.

I still believe we need to fight for our rights. But, I further believe we must clean

up our own act to avoid a fight of futility. After all, why start something one can't really finish?

Andy Answered

Back in the December issue of *Model Airplane News* I was touting a weight-lifting event for R/C. I truly believe such an event would be a needed shot in the arm for our hobby/sport. At the close of that piece I said, "Andy Lennon, where are you?" Such a question was a calculated ploy to draw the interest of a person I consider most knowledgeable in the field of low-speed aerodynamics. And, after all, a weight-lifting event really falls into that area.

Andy Lennon has developed some of the most unusual model airplanes that do some really unusual things. His Crane design is a classic with its exploration of flaps, slots, variable pitch, and low speed flight. Surely Andy's ideas would be applicable to this proposed event, or so I thought, and I was right.

His response:

"This event would certainly stimulate interest in efficient aerodynamic and structural design. Congratulations on the idea! The measures of efficiency could be: load carried, takeoff distance, rate of climb, speed, range, landing roll distance, and time aloft after a time limited climb with payload aboard.

"The first two are easily measured but the third is not. Possibly the model could be required to clear a line at, say, 10 feet at a given distance from the takeoff point. Speed could be easily measured by timing 10 runs around pylons a specified distance apart at a minimum altitude. Time would include both takeoff and landings. This would be a good test of pilot skill. Range is distance flown on a specified fuel load and is difficult to measure. Landing roll and time aloft are easily measured. The contest rules should only include standard power; .40 engine, 10% nitro, and a tank standard.

"Points could be assigned to each criterion weighted to reflect that criterion's importance: weighted carried, speed, time aloft, takeoff distance, landing roll in that order. The model achieving the highest score would be the winner.

"The model's designer would be free to select all the design parameters: wing area, wing section, aspect ratio, high-lift devices, model length and fuselage height and width, type of landing gear, tail surface areas, structure and radio equipment, number of servos, fixed or variable pitch prop, and drag reduction.

"The resulting designs would be fascinating. A few years down the road the best designs would become very similar; I can't tell one pattern ship from another!

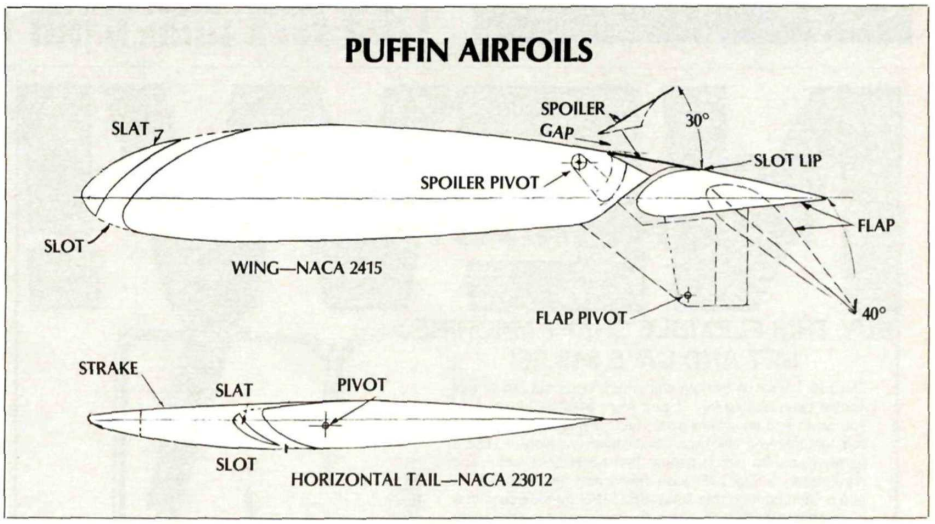
"[In the area of design] there are, I think, two approaches. First, a large model with open, fabric-covered structure, and a relatively low wing loading. Second type would be small, sturdy, and have a stressed-skin design with a high wing loading—but with high-lift features. The airplane would be fast flying but be relatively slow landing. I chose the second route.

"I include a three-view drawing plus another detailing the model's airfoils. I call it the Puffin after that comic seabird with small heavily loaded wings. The specifications include a wing area of 600 square inches, a span of 60 inches and a chord of 10 inches, and an aspect ratio of 6. The wing section is NACA 2415, and it has leading edge slots and slotted flaps over full span, and spoilers for roll control. The horizontal tail measures 130 square inches, and has an aspect ratio of 5, a NACA 23012 airfoil that is inverted with full span leading edge slots, and an all moving tail. The vertical tail measures 49 square inches and has a NACA 0012 section. The gross weight with fuel is 102 ounces and it has a 24.5-ounce loading per square foot; payload of 102 ounces for a loaded wing loading of 49 ounces per square foot. The calculated flight speed with a 10x7 prop is 70 mph. The engine is an O.S. Max .40 FSR and it has a 6-ounce tank. Landing speed at 204 ounces would be 27 mph, at 102 ounces 20 mph; takeoff speed between 21 and 29 mph depending on loading. The CG is located at 35% of the chord. The structure is similar to the Crane and is stressed-skin throughout."

I certainly thank Andy for giving the idea so much thought and for sharing his thinking with us. I wouldn't be surprised to see Puffin as a finished project in the near future. Once Andy gets his teeth into something, he doesn't let go.

(Continued on page 104)

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ROYAL CHIPMUNK

(Continued from page 91)

by reaching in with two pieces of tubing and guiding them out. Here's an easier way: do it before you attach any of the tail section.

The linkage wires are attached and held to the pushrods with shrink tubing. I recommend winding some thread and applying cyanoacrylate first, as the shrink tubing could shift or fail.

FLYING. My first attempt at getting off of a grass field resulted in a forward flip onto its back. (The supplied wheels are a little small.) After finding a smoother runway, I tried again. Fasten your seatbelts, folks! With the .40 opened wide, she jumped straight up into the air. My first thoughts were to aim it rather than fly it; yet another reason to use a .25. Once I throttled back about halfway, the Chipmunk settled into a smooth flawless track.

I'm not a pattern pilot, but trust me when I say this ship has all of the qualities of larger pattern ships. Loops could be nice and wide or as tight as a knot, and rolls showed almost no adverse yaw. On straight and level, the Chipmunk flew on rails, in spite of a stiff breeze, and cut knife-edge turns in its own radius. The ship is very sensitive to stick movement, so adhere to the control surface throw settings in the manual, even if they look scant.

The Royal Chipmunk will get you out of the basement and into the air quickly, without breaking your budget. Once in the air, you won't want to come down.

**The following are the addresses of the companies mentioned in this article:*

Royal Products, 790 W. Tennessee Ave., Denver, CO 80223.

Altech Marketing, P.O. Box 286, Fords, NJ 08863.

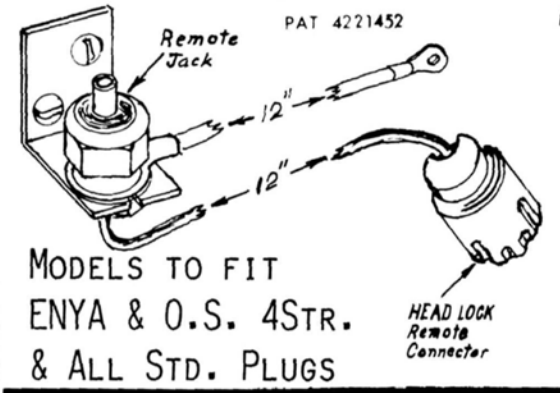
J'TEC, 164 School St., Daly City, CA 94014. ■

TEXSON TOOTER

(Continued from page 44)

you finally get control. There is a mental link between all R/C models. That link is a measurement of time, and the more proficient you become, the shorter the timespan will be. But while you are learning you need an airplane that will give you the opportunity to think things out while the plane is in the air. For an airplane to do this it must be gentle. It must be soft on the control responses, slow flying, and stable. When you first get on the transmitter you'll be behind the airplane, meaning that the airplane will

(Continued on page 99)



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TEXSON TOOTER

(Continued from page 96)

be doing things and you'll be trying to figure out what they are and how to correct them. As your flying experiences increase, the timespan between reaction of the airplane and your reaction on the transmitter will come closer together until you are in command and not vice versa. The Tooter will never win a pattern contest. What it will win is your confidence in your ability to learn the art of R/C flying. Once that is mastered, you are on your way to success in the hobby. The Tooter is a design that can bring about that success in a painless and fun-filled fashion.

**The following are the addresses of the companies mentioned in this article:*

Texson Precision Products, P.O. Box 420496, Miami, FL 33242.

Carl Goldberg Models, 4733 W. Chicago Ave., Chicago, IL 60651.

Coverite, 420 Babylon Rd., Horsham, PA 19044. ■

CONTROL TOWER

(Continued from page 35)

ter is used, the needle will drop. When it is close to the red side of the indicator, it's time for a charge. You might normally expect to get about 1 hour and 40 minutes from a fully charged transmitter pack. Next there is the aileron D/R adjustment control and the aileron D/R switch. It works just like the elevator D/R.

Moving back to the left side of the transmitter is the rudder and throttle stick. The Conquest radio series employs open gimbal construction like the G Series transmitter. Also as in the G Series, the stick is adjustable in length, about ¼ inch. In addition, the spring tension on the sticks can be adjusted to the flier's desired feel. Adjustment of elevator, rudder, and aileron sticks are accessed from the rear of the transmitter. The throttle control is detented and both rudder and throttle have electronic trims, not mechanical. The rudder trim is at the bottom under the stick bezel and the throttle trim is to the right of the stick bezel. In the center of the transmitter there is the neck strap bracket and under it is the On/Off switch. Up is On, down is Off. Incidentally, the neck strap is provided as an accessory. Continuing to the right is the elevator-aileron adjustable stick with electronic trims, elevator trim to the left and aileron below the stick. On the lower right side of the transmitter (as viewed from the front) is the transmitter charging jack.

Moving to the transmitter rear side at the upper left is an access cover to the transmitter crystal. To remove the crystal, pop the cover off and remove the crystal by its tab. Remember if you change frequency that both receiver and transmitter crystals must be changed. At the bottom is the removable battery cover. The battery may be removed by lifting its right end upward. Spring clips are used to connect the battery to the transmitter electronics so there is no soldering to connect a new battery—a nice feature.

Located above the transmitter battery pack are the five servo-reversing switches. Left to right they are aileron, elevator, throttle, rudder, and landing gear (Ch. 5). Normal is left, reverse is to the right. To adjust the spring tension on rudder, aileron, and elevator, the transmitter back must be removed by unscrewing the four phillips-head corner screws. This will reveal two PC boards. The one to the left is the transmitter RF board and to the right is the encoder RF board. They are

(Continued on page 100)

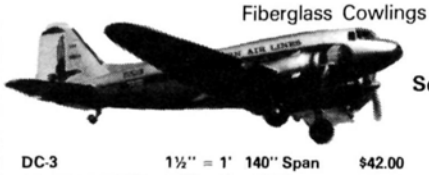
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CONTROL TOWER

(Continued from page 99)

joined by a 5-pin connector at the lower common side of each board. To expose the aileron-rudder adjustment screws, the RF board must be disconnected by gently pulling it to the left. Only the connector holds it in place when the back is off. With the elevator-aileron stick mechanics in view, the two upper left phillips-head screws are for adjustment, elevator left and aileron right. For rudder adjustment, note the two 3/16-inch diameter holes about one-third up the encoder board on the right side. The rudder adjustment screw is under the left hole. For all stick adjustments, clockwise movement makes the feel softer, counterclockwise stiffer. Well, that about wraps up the transmitter.

Moving on to the receiver the first thing that struck me was its size. It measures only 1.31x1.98x0.8 inches and contains both receiver and PCM microprocessor boards. The servos employed with the FP-T5NLP are the FP-S138 with a hefty 34.8 inch-ounces of torque, plenty for most moderately sized aircraft. I've included a summary of the salient characteristics of the transmitter, receiver, and servos in this article, so that should suffice for performance stats. I would, however, like to talk about the Conquest 5 PCM accessories. There are a bunch.

First is the FBC-8B charger. It charges the 9.6V, 500-mAh transmitter battery and the receiver 500-mAh 4.8V battery at 45 mA together or individually. Charging time is nominally 15 hours. Next is a color-coded frequency flag and mounting holder. A transmitter neck strap is also provided as are two servo trays, one for three servos plus an On/Off switch and the other for the aileron servo. Lastly, there are a total of four splined horns, two with arms (4 and 6) and two wheels (1 3/8-inch diameter, no holes, and 27/32-inch diameter with holes) and finally a switch-mounting plate.

It's quite a radio. I've seen it advertised for under $250 and predict it will be one of Futaba's best-sellers. I'll give you a report in a future column regarding its output waveform and interference resistance.

**The following is the address of the company mentioned in this article:*

Futaba Corporation of America, 555 West Victoria St., Compton, CA 90220. ■

SOARING NEWS

(Continued from page 76)

about a unique method of providing the very slick and tough wing surfaces that he uses on his slope soarers. Basically, the skins are polycarbonate sheet plastic (one brand is Lexan) of about .010-inch thickness, and are applied to the foam wing cores using any one of several possible methods, including epoxy, tape, foam cement, and others. Harry uses a pressure bonding system, or vacuum-bag technique. The material is easily cut and trimmed, and available from your local plastics supplier at a reasonable cost. It may be obtained with one surface shiny, and the other in matte finish or with both surfaces shiny.

Harry first paints the contact surface with the desired color using any one of several different paints which work, and then bonds that surface to the foam. The exposed surface is clear, of course, and the finished product looks as if it had been through a "Kalifornia Kustom" paint shop. How about that for maximum looks and minimum labor? It would be a good idea to try some different types of paint on some sample pieces to check bonding strength and possible delamination at the

(Continued on page 102)

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SOARING NEWS

(Continued from page 100)

adhered surface. The matte finish on the skin, however, does give some "tooth" for better bonding.

New Sailplane on the Block

Anyone for hand launch? More and more, hand-launched sailplanes are emerging at contests and fun-fly meets. Spanning about a meter and a half, these little ships are a joy to fly (frustrating, though, sometimes), inexpensive to build, and easy to transport. Eric Jackson from Aloha, Oregon, wrote recently to tell me about a new hand-launch sailplane called the Sunrise, designed and kitted by his fellow Portland Area Soaring Society member Craig Robinson*. Eric says:

"...the specs are: span 66¾ inches, area 443 square inches, weight 11 to 13 ounces, airfoil Eppler 387, price $34. In the last contest, I flew the Sunrise, and it's a superior flying bird. Where I used to have to work my tail off to get three or four maxes with the Pteron *(his own design—JHG)*, today I had eight maxes and three flights that were 10 seconds shy of a max. Sunrise will work the lightest lift, and penetration is quite adequate. Most club members consistently launch it to 35 or 40 feet, but I, *gorilla*, launch my dad's and mine to 50 or 60 feet in no wind! We have "Sunrise slope races," too—what a blast! Just like Q-Tee pylon races, only better. In the last contest, seven out of eight contestants flew Sunrise. You gotta have one, Jim!"

Okay, so I gotta have one, and I'll buy that, Eric, but the one thing I can't buy is an arm like yours. So, a substitute might be about 50 feet or so of ¼-inch flat rubber, and about 100 feet of monofilament fishline with a bandanna or handkerchief tied at the end for visibility when it comes down. I've heard that this makes a great launching device for the small sailplanes, and gives consistent launches from 35 to 50 feet. Sure beats destroying your arm for us flabby old timers!

New Guy on the Block

Well, it's actually an old friend in a new position, Jeff Troy,* who has moved from Allied Hobbies in King of Prussia, Pennsylvania, to the post of assistant public relations officer at AMA Headquarters.

As most of you know, Jeff was a sparkplug of the Valley Forge Signal Seekers Club having held the positions of president, secretary, newsletter editor, and many others. He is known for his scale wins, impeccable building/covering practices, and contest directing. As CD of two nationals (R/C Sailplanes), Jeff has finally caught the eye of the AMA, who presumably said, "Hey, we gotta have this fellow on *our* team!"

Jeff has published something of interest to all of you would-be contest directors and contest organizers, and has been asked to present a paper on the subject of "organizing a successful soaring contest" at the M.A.R.C.S. Soaring Symposium in Madison, Wisconsin, in early November. I'm sure that copies of this paper will be available soon. You may want to write to Jeff at the address given.

That's it for now, gang. Keep the cards, letters, and pictures coming.

Jim Gray, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses pertaining to this article:*

Posey Mfg. Co. (P.O. Box 418, Hoquiam, WA 98550).

Craig Robinson, Performance Designs (2105 S.E. 85th Ave., Portland, OR 97216).

Jeff Troy, Assistant PR Director, AMA (1810 Samuel Morse Dr., Reston, VA 22090). ■

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R/C NEWS

(Continued from page 95)

Sometimes Models Are Strictly For The Birds

You'll remember the beautiful Gee Bee by Don Neill that stole the show at last year's Byron Fun Fly. The gorgeous yellow-and-black airplane flown by Terry settled any thoughts one might harbor about Gee Bees being unstable or difficult to fly. Even so, Gee Bee "luck" prevailed finally and the model is no more! And it was lost in a fashion I've never heard of before. It was destroyed as the result of a mid-air with a bird, a crow!

Don writes, "It happened at Council Bluffs, Iowa, during a fun-fly. I think the bird hit the wing, breaking the aileron loose, causing vibration that broke the wing apart. No one actually saw the collision but both bird and airplane were in one pile in a cornfield. Feathers were stuck in the aileron."

It's a pity that airplane (and bird) was lost. All of us lose something when the outstanding examples of a modelers' art are destroyed. And Don's Gee Bee was surely outstanding. One thing I know for certain, there will be other outstanding models coming from the Don Neill workshop and I look forward to seeing them.

See you around and be careful of those birds!

Art Schroeder, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

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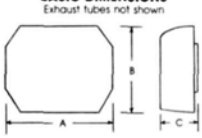


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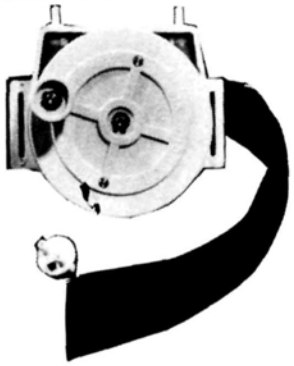
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CYANOACRYLATES

(Continued from page 63)

these cases, a spritz of Kicker aimed at the glue joint will not only speed the drying process, but will also allow the CA+ to fill those gaps to a greater degree.

CA+ is ideal for balsa-to-plywood bonds as well as balsa-to-balsa. It will also bond various metals, plastics, rubber, vinyl, cloth, nylon, and fiberglass. For best results, materials other than wood should be lightly sanded and cleaned before applying the glue. One drop of CA+ is great for temporarily attaching control horns in place and holds well enough so you can drill through the horns without fear of them coming loose. It's sort of like having another pair of hands sometimes! I've used Zap A Gap for regluing firewalls (even if there is some oil residue), tacking fiberglass tape to a wing center-section, fastening rubber bands to landing gear doors, gluing servo rails in place and probably in a hundred other situations. The dried glue joints are extremely strong and durable.

One of my favorite areas to use CA+ is the bonding of carbon fiber strips to balsa bulkheads for the lightest, strongest assembly possible. This stuff just loves carbon fiber material. And remember, for very close fitting parts you don't need Kicker.

Slo Zap

This one is really getting into the specific formula idea for adhesives. Slo Zap is a much thicker CA and actually takes 30 to 60 seconds to dry. But, if a bead of Slo zap is squeezed out to a thin layer, it will dry in the same fashion as CA+. Slo Zap can be used in almost any area where we previously used white glues, epoxies, or contact cements. It works exceptionally well on balsa-to-balsa, plywood-to-plywood, plywood-to-balsa, plywood-to-hardwood, and hard-

wood-to-hardwood. Since there's more time to position the parts, a bead of Slo-Zap may be applied to one of the parts and slowly, gently put into position. In hard-to-get-at places, or in areas where precision is a must, you can't beat this formula. I use it for firewalls, landing gear mounts, hardwood motor mounts, wing hold-down blocks, etc. It really is a lot faster and stronger than epoxy. It's also a whole lot lighter and cleaner. Perfect joints with no webs can be made with a little care.

One of the areas where I really like Slo Zap is in any type of laminating. I just put a bead of glue around the perimeter of the parts and a few crisscrosses of glue on the interior and put the parts together. I then rub my hands all along the surface to ensure that the glue has oozed to as much surface area as possible and 60 seconds later my laminations are complete. A couple of spritzes of Kicker aimed at the joined parts will further speed up the drying time if you're in a real hurry! You'll find that all joints made with Slo Zap are virtually indestructable. Try gluing a couple of pieces of 3/8-square maple motor mount material together, letting them dry for a couple of minutes and then attempt to break the glue joint. You know what? You can't!

You might also want to try making fillets from Slo Zap and Kicker. Simply apply a large bead of glue where you want the fillet and immediately spray with Kicker. The Kicker stops the glue from flowing any farther and forms a very smooth crust immediately. The glue that is still in its liquid form under this crust will take 4 to 6 minutes to cure, but when it's done, you've got a very smooth, very light, and very strong fillet. This technique works great around stabs and fins.

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(Continued on page 106

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with engine 18.00
Super Cub 1/4 scale 18.00
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Liberty Sport 12.00
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CONCEPT: Fleet Biplane 15.00
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Monocoupe 90 AL 20.00
Pietenpol Sky Scout 15.00
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Within the 48 continental states add $3.00 shipping charge. Va. residents add 4% sales tax. C.O.D. accepted (add $2.65 to shipping charge). Outside 48 continental states, write for shipping charges before ordering, include $1.00 U.S. for return postage and handling.

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703-890-6017 9 a.m. to 9 p.m. EDT.
Also available radial cowls, wheelpants and hundreds more cowls for other kits and plans. Send SASE for 6-page brochure.

CYANOACRYLATES

(Continued from page 105)

advantage of remaining flexible enough to take some extremely harsh shocks. Flex Zap is *not* a versatile glue. It was formulated to work on hardwoods, fiberglass, and carbon fiber materials. It doesn't work on balsa, doesn't like cloth, and doesn't respond well with Kicker. A thin bead is all that's required for a good bond, but the parts must fit together well. You have 30 to 90 seconds for positioning depending on the size of the bead of glue. Full curing takes a *minimum* of two minutes. This may take longer depending on material, temperature, and humidity. But don't get impatient, the stuff will dry and boy is it strong.

It's ideal for fastening plywood bulkheads to fiberglass fuselages, hardwood motor mounts to plywood bulkheads, laminating plywood, and especially carbon fiber material to hardwood or fiberglass. The fiberglass or carbon fiber should be sanded first for the strongest bonds. Under severe vibration, Flex Zap will not, if used properly, allow joints to pop apart. Nylon parts, if sanded first, can be glued to plywood pieces with just one drop of Flex Zap. No, I'm not suggesting gluing your elevator horns in place, but there are plenty of other areas where we use nylon brackets and the like.

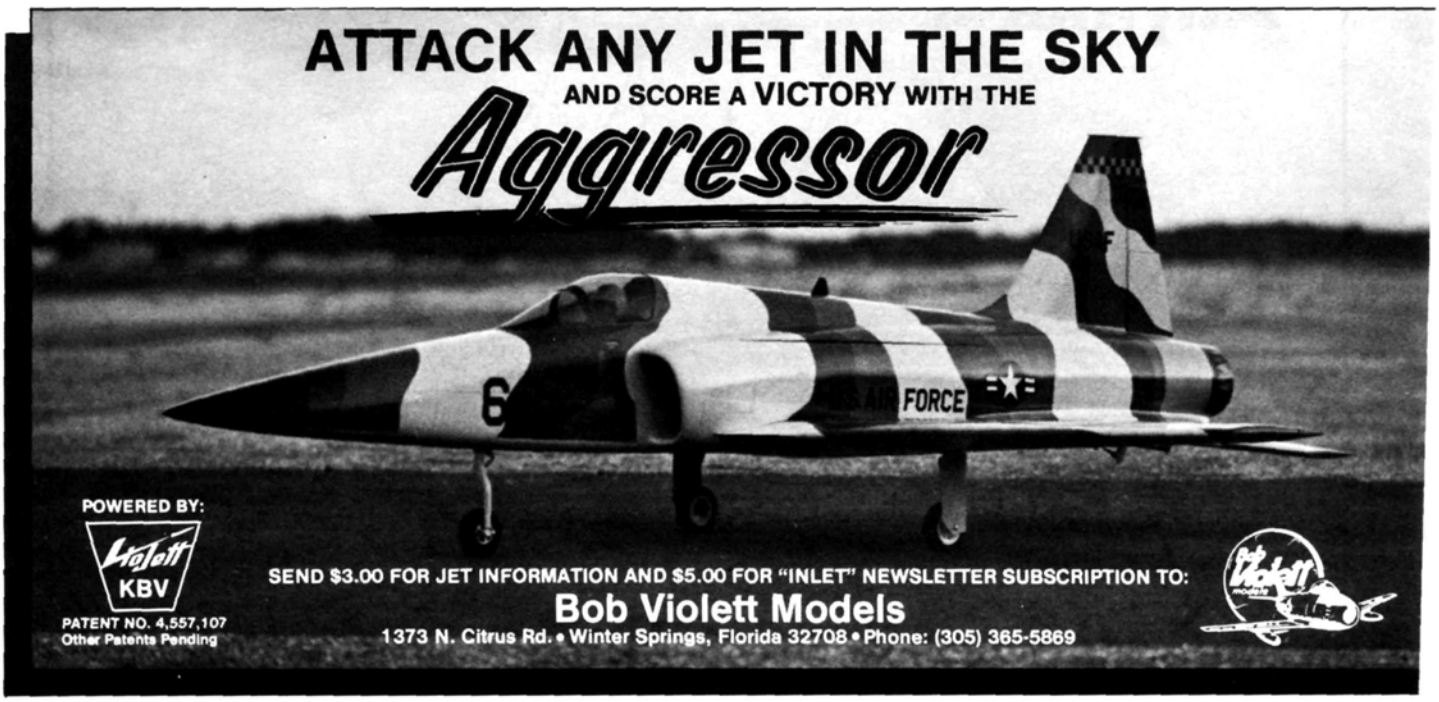
Zip Kicker

"Kicker" is a specially formulated product designed to instantly set the surface of any cyanoacrylate glue. As a bonus, it also allows the glue to expand as it dries, which helps fill those unsightly voids and gaps we get from poor-fitting parts. Usually a couple of squirts from the pump sprayer, directed at the joint, is enough to cure the glue instantly. Kicker is not only a time-saver when using slower drying CAs, but it also allows us to bond dissimilar materials together. By the way, my wife uses a mist of kicker to dry her freshly painted fingernails in one-third the time it normally takes. Kicker doesn't seem to harm most finishes, but if too much is used, it will turn the excess CA white in color, which you may not admire on a finished project!

Plasti Zap

Even though Plasti Zap was designed and formulated for the plastic kit industry, it has a few places where it can be used in general modeling. A thin film of Plasti Zap will bond ABS wing tips or other light plastic parts to sanded balsa or plywood. If you're careful you can use it to attach clear lenses and canopies to a finished project, but very little glue must be used. It takes up to two minutes to fully cure, but remember that it is still a form of cyanoacrylate, so you don't want to be

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CYANOACRYLATES

(Continued from page 106)

messy with it. Kicker may be used with this product, but a combination of too much glue or accelerator could produce enough heat to fog the inside of your clear lens of canopy.

Z-7 Debonder

This product can sometimes be worth its weight in gold. Used properly it will disjoint any parts assembled with any CA type adhesive. The secret is to apply and keep reapplying a few drops to the joint and wait. Sometimes a few minutes, depending on how much glue or Kicker you've used, will be necessary but the parts *will* come apart. Debonder also removes dried CA from your hands by simply applying a few drops over and over and rubbing the solution into the glue. Eventually, the dried glue will start to ball up like rubber cement and come off. Debonder removes lots of stains off of lots of things so be sure to try a test sample before wiping down your airplane. It removes dried CA from some plastics used in canopies. As I said, use on a test piece of material first.

ZFP

The initials ZFP stand for Zap Foam Primer. This product runs a close second to Flex Zap in the confusion concerning its use. ZFP is a primer but it's *also* an accelerator. Sort of protective Kicker for foam! The secrets of using ZFP are really very simple to understand. First of all, try adding a bit of food coloring to the product so you can *see* where you're spraying it. (I understand that Pacer is taking our suggestion and doing this at the factory as of '87.) Second, allow the product to dry somewhat, but not perfectly. And third, in most cases, use *only* Slo Zap on the material to be bonded to the damp foam surface. For example, to sheet a stab panel first spray the ZFP on the sanded foam core. Wait about three minutes and apply Slo Zap in beads to the perimeter and interior of the balsa skin. Now lay the skin down on the foam core and roll the skin from the trailing edge to the leading edge the same as you would've done if you were using contact cement. What is happening is the accelerator portion of ZFP is forcing the cure of the Slo Zap while the primer portion is

(Continued on page 113)

MODEL AIRPLANE NEWS
HOBBY SHOP DIRECTORY

Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the **Model Airplane News Hobby Shop Directory.** The listing will be published monthly and will be listed according to city and state. You will have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address, and telephone number.

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R/C & Rubber Power planes, gliders & helicopters. Futaba, Top Flite, Goldberg, Guillows, Midwest, K&B, O.S. Max, Fox, Cox, & others. Paints, supplies, & acc. Trains, plastics, rockets, & stamps. AE, MC, Visa. Hours: Mon.-Sat. 9:30-6.
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OKLAHOMA—Tulsa
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Directory space is sold on a yearly basis with a choice of three payment plans: 1. $179 per year, payable in advance; 2. $97 for six months, payable in advance; or 3. $17.50 per month to be billed monthly. Space reservations must be received by the 15th of the third month preceding publication (for example, January 15th for the April issue).

Send sales message and payment to **Model Airplane News Hobby Shop Directory,** 632 Danbury Rd., Wilton, CT 06897.
For further details or information on our special introductory offer, call toll-free 1-800-243-6685 and ask for Debbi O'Connell.

Club of the Month

The Flying Pilgrims of Canton, Michigan, are the *Model Airplane News* "Club of the Month" for March 1987. At the time of this writing Ted Murphy is the club president, but his position is up for grabs in an upcoming election. Bert Brian and Tom Keeling are nominees for president. Jerry Basierbe stated that he would also run if Fred McKarge would provide the funds for his limo.

Club meetings are always interesting, and coffee and doughnuts are provided free of charge. Hubert Cline has helped in this regard. In fact, his plan is to offer a full buffet with cheese and crackers if someone will help him build a plane. Don Carbonneau, a recent graduate of the Pilgrims fledgling flight program, did offer to help Herb learn how to land a plane. The club holds several contests and fun-flies each year, and their fun-fly '86 was reported to be a huge success. The event was even given a spread in the Canton *Community Crier*, the local newspaper.

Model Airplane News applauds the Flying Pilgrims and is pleased to award two free one-year subscriptions, which are to be given by them to their outstanding junior members.

Congratulations!

Each month Model Airplane News will select the club newsletter that best shows the club's activities and energies directed toward the furtherance of the hobby. The award is not based on size or quality of the newsletter, and can be about any aspect of the hobby (F/F, C/L, R/C, boating, cars, etc.). Model Airplane News will award two free one-year subscriptions to be given by the club to outstanding junior members. So send your newsletter to Model Airplane News, Club of the Month Contest, 632 Danbury Rd., Wilton, CT 06897.

CYANOACRYLATES

(Continued from page 110)

protecting the foam. The result is a perfectly sheeted slab in about 60 seconds, or less, with miniscule weight build up! The only error you can make is to not coat the foam part evenly with ZFP and allow the glue to come in contact with these unprotected areas. You know what happens then? The heat generated by the glue during its drying process will eat a channel or hole into the foam core. So just be careful and you'll have no problem.

**The following is the address of the manufacturer mentioned in this article:*

Pacer Technology and Resources, 1600 Dell Ave., Campbell, CA 95008. ■

HELICOPTERS

(Continued from page 39)

the Kalt versions, and are available from Circus Hobbies*.

Last of the additions are a few items that you'll eventually have to acquire if you become at all serious about the sport, yet you can get by without them for now. First, you'll need some sort of precision pitch gauge. This is available from a

(Continued on page 126)

Hobby Horn

KITS FOR ELECTRIC POWER:

The SENSOAR Glider, 78", 05/LT-50 Direct	$18.00
The ULTRA MK IV Glider, 86", 05's Geared	$39.00
The ELECTRICUS Glider, 74", 05/LT-50 Dir.	$32.50
Astro's CHALLANGER Glider, 73", 05's	$32.50
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Midway's FAST EDDIE, Aerobat & Sport, 05's	$19.00
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ASTRO AC/DC CHARGER, Current Adjust	$55.00
ASTRO ON-OFF Motor Control (Electronic)	$30.00
ASTRO MICRO SWITCH (wired w/dynamic bk)	$5.00
ASTRO HIGH FLEX WIRE (Red/Black, 4' pk)	$2.00
GOLD PIN MOLEX CONNECTORS (One Pair)	$2.25
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LEISURE LT-50 3-1 or 3.8-1 Sys (Specify) 7c	$72.00
LEISURE 105 Charger, 6/7 cell, DC only	$28.00
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Single Cells--800ma, $3.50 ea; 1200 ma, $3.50 ea.**

OLD TIMER KITS---NEW from P & W Model Service

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DUKE'S MIXTURE

My wife and I visited the Memphis Model Show a couple of weeks ago. While not nearly as big as the White Plain or Toledo shows, it was at a beautiful facility (The Civic Center) and we were very graciously cared for.

At the banquet that Saturday evening, we were shown a video tape of model activities over the previous year. Of all of the films and tapes that I have seen on modeling over the years, this was by far the most entertaining. I would highly recommend that you get a copy of this. Their price is modest. Write or call Milton Dickey, 2989 Clarendon, Memphis, TN 38118. Their phone number is 901-365-1736.

I showed our new 40BB Delux on a biplane I had ready for covering. Having taken aircraft structural engineering at Stanford, I tend to be rather creative on my models' structures, and this attracted more attention than my new motor. This brings up the question — why haven't any of the model magazines printed a comprehensive series of articles on structures? I think an understanding of D tubes, Geodetic structures, the Warren Truss, meaning of shear, bending, tension and compression and factors contributing to rigidity should make interesting reading. And, perhaps, contribute to stronger, lighter, and safer models.

For you freebie collectors, here are some things that you can get at Fox for free; our catalog, price sheets, parts lists, 3 views, and a reprint of an article on how to analyze glow plug problems. Just call or write. (501-646-1656)

It has now been some 59 years since I built and flew my first ROG model, and about 51 years since I built my first engine powered model. I would like to hear from any of you out there who have been at it longer.

Ducted Fan Flyers: If all goes well, we will be offering a fan version of our Eagle III this Spring. Plan is to market this one only through Byron, Jet Models, Jet Hangar Hobbies, and factory direct.

How many of you would spend a few dollars for copies if I made up a video tape giving you a tour through our plant?

Happy flying.

Duke Fox

P·L·A·N·S
D·I·R·E·C·T·O·R·Y



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WANTED: RTF U-Control planes from Cox, Wen-Mac, Comet, Aurora, Testors, etc., complete or pieces, buy or trade. John Fietze, P.O. Box 593, Lynbrook, NY 11563.

ANTIQUE MODEL IGNITION ENGINES—PARTS CATALOG, 50 pages, precision cast timers, original cylinder heads, point sets, drive washers, tanks, for GHQ, O&R, O.K., many others. Large catalog $4.00 pp. Chris Rossbach, RD 1, Queensboro Manor, Gloversville, NY 12078.

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WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063.

OLYMPIC COLLECTORS: Newsletter features news, ads, tips for beginning collectors, and where to write for free pins. Three sample copies sent free. W.J. Nelson, Box 41630, Tucson, AZ 85717-1630.

BEGINNERS, discouraged by too-fast R/C "trainers"? Send $1 and a stamp for evaluation of over 20 well-known models rated for their ease-of-flying. James Waterman, 3818 Deerfield Dr., San Antonio, TX 78218.

FOR SALE: 12-page listing of model airplane mags., books, plans, etc. One dollar plus SASE with 37-cent stamp. J. Willard Vaughn, 506 Wadsworth St., Radford, VA 24141.

FOR SALE: *Flying Aces* 1935-1944, *Model Airplane News* 1931-1960, others. $1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3.

NYLON MACHINE SCREWS, nylon wire ties, polyethylene glue guns. Free lists. Transmotions, Inc., P.O. Box 160M, North Hollywood, CA 91603.

FIGHTERS! Most complete collection of aircraft prints, posters, and postcards. Free catalog! MACH-3, Box 1390C, St. Louis, MO 63188.

ATTENTION, COLLECTORS: For sale, Brazilian-produced WB diesel and glo engines, 1.5cc, 2.5cc, .35. Price U.S. $150/part. Udo Eugen Linke, Caixa Postal 24 18130-Sao Rogue, S.P., Brazil.

OLD TIMER SUPPLIES, everything you need, plus custom engines, parts. Immediate service. Detailed brochure: $1.00. Kustom Kraftsmanship (MAN), P.O. Box 2699, Laguna Hills, CA 92654.

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PRIVATE COLLECTION: Hundreds of aviation magazines for sale—*Popular Aviation, Flying, Model Airplane News, Air Trails, RAF Flying Review, Wings,* and many others. 1932-1960. All in excellent condition. Send $2 for list. William C. Fort Jr., 4161 Robin Hood Rd., Jacksonville, FL 32210.

SCALE DOCUMENTATION: PLAN ENLARGING. Photo packs, 3-views, drawings for 1,600 aircraft, super-scale R/C plans for Giant, Sport; 30-page catalog $3. Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; 919-292-5239.

FOR SALE: Reconditioned Kraft radios, and other brands of American-made radio systems. We still buy used Kraft Systems radios all years, and have a good selection of 7-C systems which are 1991 ready now. New order of 8FD receivers and modules just in, $150.00/set. More Channel Masters also just arrived at the new price of $175.00/set. Jay-En R/C now has transmitter and airborne Ni-Cd packs made exclusively in our shop with American-made cells. JN-900: 900-mAh with Kraft connector 4.8-volt flat or square $26.95 each; JN-1200: 1200-mAh 4.8-volt pack with Kraft connector flat or square $36.95 each. These packs are warrantied for 13 months and are available with Futaba, JR, Airtronics connectors at the same price. Transmitter packs for Kraft available 700-mAh for 5C or 7C transmitters. New store hours: Monday through Saturday 9:00 to 7:00 p.m. Closed Sundays. Jay-En R/C Supply, P.O. Box 4248, Hilo, HI 96720; 808-961-5100.

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FOR SALE—GREAT OPPORTUNITY: Schluter Heli-Star helicopter constructed by perfectionist and flown only one hour, Futaba 7-channel radio, and full accessory list too large to mention—all new. Retail value over $3,000, yours for only $1,500 firm. Call 617-295-7476 days and 295-7351 evenings. This won't last long.

JETEX ITEMS AND KIT WANTED for cash. Kits by such makers as American Telasco, Berkeley, Comet, Cleveland, Monogram, Tailored, and others. Paul Williamson, 5032 S. Ridgeview, Nashville, TN 37220.

MODEL ENGINES, IGNITION AND GLOW: collectors, runners, used, new. Sell, trade, buy. SASE for engine list. Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555, 619-375-5537.

HARRY HIGLEY BOOKS: *There Are No Secrets*—on finishing model aircraft, including paints, adhesives, heat-shrink plastics, shaping, sanding, priming, etc. *Harry's Handbook for Miniature Engines*—from basic theory, components, and fuel to break-in, repair, and new developments. *Master Modeling*—explains drawing plans, how to scratch-build, use plastics, foam, fiberglass, balsa, and plywood. *Tom's Techniques*—from Tom Ingram, in collaboration with Higley, applying plastic film, covering wings, fuselages, Horner wing tip fillets, etc. Hundreds of photos. All books are $10.95 each, plus $1.50 postage each. *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897.

COLLECTORS: Hard-to-find kits: planes, armor, cars. List $2.00. Vintage Hobbies, Box 5091, Station F, Ottawa, Ontario, Canada K2C 3H3.

KAVAN IGNITION ENGINE: Still in box $1,000. Never been run. A gem. Best offer. Clifford Fox, 2 S. Main St., Montgomery, PA 17752; 717-547-1763.

O.S. 4-CYLINDER, 4-CYCLE ENGINE: New, yet in box. Must have $900. Clifford Fox, 2 S. Main St., Montgomery, PA 17752; 717-547-1763.

CURIOUS MINDS WANTED: Inventors, entrepreneurs, ideas can become reality. Sample issue of Inventrepreneur $3. Eason Concepts, 1284 W. Crescent, Redlands, CA 92373.

MAGAZINES FOR SALE: *Aeromodeller, Airpower, Wings, Air Trails, Scale RC Modeler, Model Aircraft, Flying, Skyways,* and more. Many going back to 1930s and 1940s. Excellent to mint condition. Send SASE for list of titles, any inquiries to Mrs. Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086; 716-681-4840.

Send ad and payment to *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897. **Non-Commercial classified ads** (commercial ads of any kind not accepted at this special rate). Rate: 15 words or less, $4.50 payable in advance. No charge for name and address. Additional words, 25¢ each. **Commercial classified ads** (rate applies to anyone selling on a commercial basis—retailers, manufacturers, etc.). Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number. **Closing Date** for either type of ad is the 15th of the third preceding month (for example, January 15th for the April issue). We do not furnish box numbers. If you would like your ad to run in more than one issue, multiply amount of payment by number of months that ad is to run. It is not our policy to send sample copies or tear sheets.

NAME THE PLANE CONTEST

Can you identify this aircraft?

If so, send your answer to Model Airplane News, Name the Plane Contest (state issue in which plane appeared), 632 Danbury Rd., Wilton, CT 06897.



January's Mystery Aircraft

Wingless airplanes were a fascinating possibility, especially for the military in 1937. The Kellet Autogyro Corporation, headed by W. Wallace Kellett, had a long history of engagement in the research and development of such an aircraft, and the Kellett YG-1A (later designated KD-1 SN36-352), our mystery aircraft featured in the January '87 issue, was a result of those efforts. Having a rotor diameter of 40 feet, the craft was capable of 125 mph and could land on a roof top, as was demonstrated in 1935 by one being set down on top of the Philadelphia Post Office Building. Not only were the Post Office officials so impressed that they placed orders for the craft, but the military saw great potential in the design as well. This success gave Kellett the financial means to go on and develop helicopters until 1961.



Congratulations to James Wright of Tullahoma, Tennessee, for correctly identifying our mystery aircraft. Other correct entries were received from Bill Ferguson, Alexander Pafiolis, Bill Luig, and many others.

The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail. If already a subscriber, the winner will receive a free one-year extension of his subscription.

HELICOPTERS

(Continued from page 113)

number of sources so check with some of the helicopter specialty houses. I intend to do a feature article on this subject at a later date. The second set of items is used for balancing rotor blades (both mains and tails), and other components of the model. They are the High Point Balancer (from High Point Products), and a good quality beam balance, along with a few accessories, like the main shaft and counterbalance pictured from California Model Imports*. All of this is needed to accurately balance all of the spinning masses so that your machine doesn't vibrate itself to destruction. Once again, I will get into the balancing process in a future article.

Yale Hobby Manufacturing

As mentioned earlier, and as part of what I intend to be a series of spotlights on some of the manufacturers and suppliers to this sport, I'd like to introduce you to Yale Hobby Manufacturing. Yale Hobby has been bringing their line of "True Spin" rotor blades to us for about five years. As part of his own quest for perfection, over this period of time, Yale Hobby Mfg. founder and president Jeff Urcan has continued to improve this line of rotor blades, as well as adding more to the line. Yale Hobby was the first to offer pre-slotted rotor blades and weight kits for non-metallic weighting of rotor blades (a must for conforming to FAI rules in competition). To my knowledge, Yale Hobby is also the only rotor blade manufacturer to offer pre-shaped, machined wooden blade holders that match the rotor blade so that you won't have any carving or filling to do (not all blades require the wooden holders). Yale Hobby now offers more new accessories for the model helicopter enthusiast, such as heat-shrink blade covering, precision-ground steel mainshafts, crystal clear vacuum-formed plastic canopies, fiberglass canopies, training gear, quilted blade covers, and more. Over the next couple of months, I'll try to show you some of these products in detail.

Craig Hath, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

Yale Hobby Manufacturing Inc., 20 Holly Lane, Wallingford, CT 06492.

California Model Imports, P.O. Box 1695, Garden Grove, CA 92642.

Circus Hobbies Inc., 3132 S. Highland Dr., Las Vegas, NV 89109. ■